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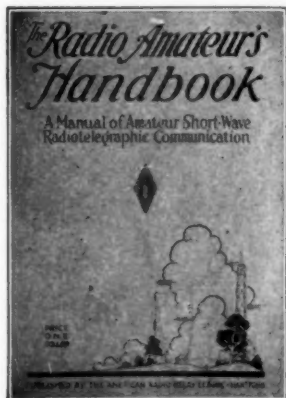


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AMERICAN RADIO RELAY LEAGUE

HARTFORD, CONN., U. S. A.



QST



The Official Organ of the A.R.R.L.

VOLUME XIV

SEPTEMBER, 1930

NUMBER 9

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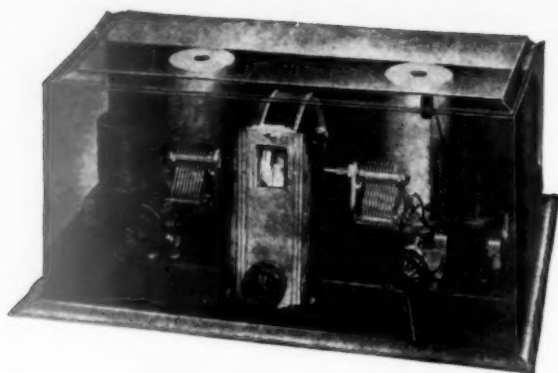
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EDITORIALS

IT IS to us a source of great satisfaction that with the passing of some phases of radio pioneering the amateur has not lessened his value to the art but has risen to the position of one of the solid and respected settlers of the communication picture.

We passed through a period in which amateur radio was a game that was little heard of outside its own circle, then through a period of high-frequency pioneering when the widest and most extravagant publicity greeted each amateur discovery. Now we are on a basis where the amateur is an integral part of the radio operation of the nation, not greatly talked about but essential in several ways that many amateurs never suspect and that few in other communication branches realize. Consider, for example, the undeniable facts that the fundamentals of the world's knowledge of high-frequency behavior were derived entirely from amateur observation and that the American high-frequency communication systems, both commercial and governmental, are built upon the results of amateur pioneering. Regard, for instance, the fact that the biggest part of the radio engineering staffs of to-day are being drawn from amateur ranks. Contemplate, if you will, how the amateur is adapting himself to this state of affairs and becomes more and more the experimenter and the operator, less and less the tinker or the publicity seeker. Add to this our vast free message service for the public, the duty our Army entrusts to us in handling organized distress communication, the extent to which we are a training school for executives in the industry and skilled operators for the government services and the commercial operating world — consider these together and you have a total of rich worth, well justifying the traditional American government policy of encouraging amateur radio.

Why this summation? It's because we want to stiffen the backbone of amateurs everywhere by increasing their consciousness of their great value as a class — because the time approaches when a big and hard job must be undertaken. International conferences loom on the radio horizon, the C.C.I.R. at Copenhagen next summer, the new international treaty to be negotiated at Madrid in 1932. Already in the United States preparation has started for the Copenhagen meeting, a technical conference which this time is doubly important because of the effect of its recommendations upon the Madrid situation. League representatives are actively participating in this preparatory work. In this country, as always, we need have no doubt about the attitude of our Government — they will be "for" us. In other countries too, however, study commences for Copenhagen and Madrid, and there the situation is different — yet very important to all of amateur radio because all these countries vote in the international decisions to be reached at those conferences.

The amateur outside of this country and Canada and a very few other places seems to be in mortal fear of his Government. Here is where we hope to inject a little of the old spine by asking our overseas brethren to convince themselves of the merit of the amateur movement and act appropriately. We must not be afraid to crash in where we can be of use and thus demonstrate the national value of amateur radio. In many a European country we in North America must infer that the amateur society is afraid to do anything about unfavorable amateur regulations promulgated by a Government that does not know the amateur — that is, beyond making mild and strictly parliamentary objection in carefully-chosen language. These government radio administrators are people, aren't they? There is some way to get to see them, isn't there? They need to be told,

clearly and succinctly, what amateur radio is and all about its demonstrated great value in the national economy, and what recognition properly ought to be extended to it. When parliamentary objections are inadequate to produce the necessary results, other methods must be invoked. Contact and real representation before the radio administrators are essentials. Honest education about the amateur is the best remedy; a campaign of concerted effort may be necessary; unfortunately improvement generally involves a willingness to engage in a certain amount of scrapping, and that may be in the picture too.

We hold that few Governments of their own volition and wisdom will be found ready to give amateur radio its due — not until the amateurs of that country demonstrate their worth, speak their piece, say what they want, and prove that they're entitled to it. We assert that that policy is the one which has gained recognition for the amateur in lands where he is adequately provided for, and that such action has always shown itself to be in the national interest. The A.R.R.L. therefore urges its sister societies of the world to commence now an aggressive policy of demonstrating the national value of amateur radio and bringing the same to the attention of their Governments; of asking for, and expecting to receive, national amateur regulations commensurate with the provisions and recognitions of amateur radio in the existing Washington Convention; and particularly of preparing, in the official mind, a wholesome understanding and respect for and a sympathetic attitude towards the radio amateur that will exist during the preparation of their Government's views for these international conferences and leaven their delegations' actions there. This is a hard job, but amateur radio is worth it and must have its deserts. The job requires men of vision, intelligence, enterprise and courage. The next two years mean a great deal to amateur radio. It is time now to go to work!

K. B. W.

Doings at Headquarters

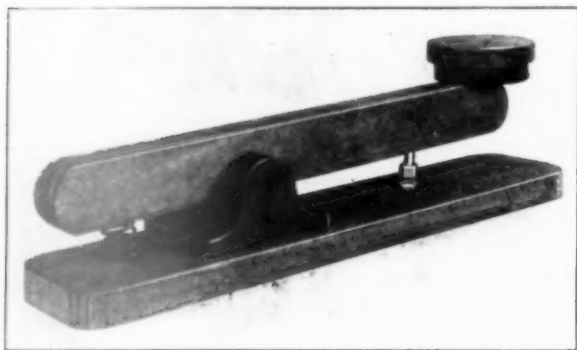
SINCE the last "Doings" we have had visitors from all parts of the country, mostly amateurs with and without wives and "sweeties," who are touring around the country during the summer.

After the Byrd ships docked in New York three of the radio personnel, well known to the

Arctic Expedition also) and H. N. Shrimpton (ZL4AO) paid us a visit. We had an informal dinner with President Maxim as toastmaster, and were regaled with tales of the radio work of the party. Mr. Shrimpton joined the Expedition in New Zealand to operate aboard the *Eleanor Bolling* (nicknamed *Evermore Rolling*) between New Zealand and the base, as well as back to U. S. A. Mr. Shrimpton created quite a sensation

with an immense key which had "Kiaora" (meaning, "greetings") inscribed on it. Kiaora was presented to the A.R.R.L. from the New Zealand Amateur Radio Transmitters, of which organization he is vice-president. This is a real key, as may be seen from the photograph, and overall dimensions are 28" x 7" with real good heavy "buggy" bolt contacts. Written on all sides of Kiaora are names of members of N.Z.A.R.T. as well as the operators of the Byrd Antarctic Expedition. This key was originally designed to keep order at a farewell dinner in New Zealand given the Byrd operators and then it was entrusted in care of Nev Shrimpton to suitably present to A.R.R.L.

This token of "hamship" from our brothers in New Zealand has been placed behind portals guarded by nothing less than the Wouff Hong. Our hearty thanks, Zedders! (Cont. on p. 35)



"KIAORA," PRESENTED TO A.R.R.L. FROM NEW ZEALAND AMATEURS

amateur fraternity throughout the world, Malcolm P. Hanson, chief of radio personnel, Lloyd K. Grenlie (both members of the Byrd

Making Practical Use of the 56-Mc. Band

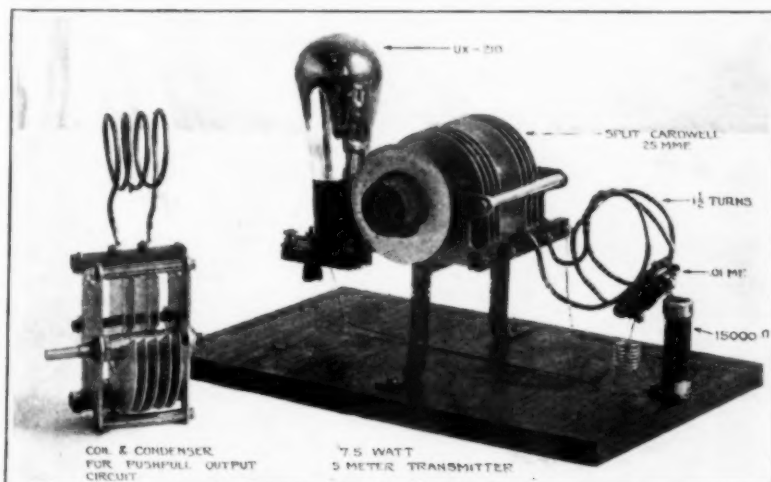
Successful Phone Work on "Five Meters"

By J. J. Long, Jr., W8ABX*

The opening of the 28-mc. band and the necessity for improving our technic on the lower amateur frequencies have more or less distracted attention from the "five-meter" band during the last few years. The 56-mc. band has not been entirely unattended, however, and a small group of intrepid experimenters have been doing great things with it. This band offers tremendous promise as a useful band for communication between points within "sight-line" of each other and is particularly fine for radiotelephony. Its DX possibilities also offer encouragement. The small antenna systems required make the use of directive transmission especially easy, and tremendous signals are possible with low power. — EDITOR.

ANY development work in radio communication requires the coöperation of several experimenters. Those who assisted very materially in the work described in the following pages are WSPK, Ethelbert and Charles Seiler of East Bloomfield, N. Y., and WSBHM, Wilfred O'Brien of Fishers, N. Y. The

long and then cut into two sections each 49.2" long. A wooden frame was built and the antenna mounted as shown in the photograph. The antenna must be at least $\frac{1}{2}$ wavelength above the ground in order that the dimensions shown will give a true wavelength of 5 meters, because the capacity effects to ground will tend to raise the



THERE ISN'T MUCH TO THE 56-MC. OSCILLATOR

For telephony the modulator plate is connected to the same positive plate voltage terminal of the 404 power pack as the oscillator. The modulation chokes are in the power pack.

object of these experiments was to see whether it was possible to use the ordinary equipment found in the average amateur's shack to operate with any degree of success on the "five-meter" band.

The first thing done was to cut a five-meter half-wave antenna to the proper length. A piece of $\frac{1}{4}$ " copper tubing was used. It was cut 98.4"

wavelength. This holds true also for any conductor brought near the antenna.

Previous to the time when we started to try communicating on the 56-mc. band, experiments were tried with different types of circuits to determine which was best adapted to use with a Type '10 tube at such frequencies and which was foolproof in operation. We give Hoffman of W9EK the credit for having the very circuit that we were looking for, all mapped out in QST.¹ This circuit is a split-coil Colpitts, allowing us to feed the power for the plate and grid of the tube

* WHAM, Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

¹ The push-pull circuit used in the transmitter described in QST, June, 1930, is especially fine for the 56-mc. band. Type '10 or '52 tubes may be used. — EDITOR.

at a point where the r.f. voltage is practically zero. This eliminates the bother of r.f. chokes, which are quite critical at 56-mc. This same cir-

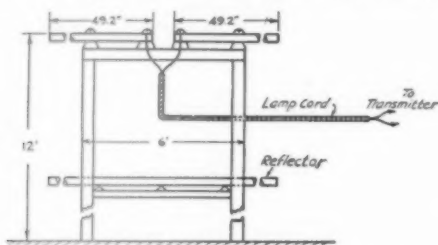
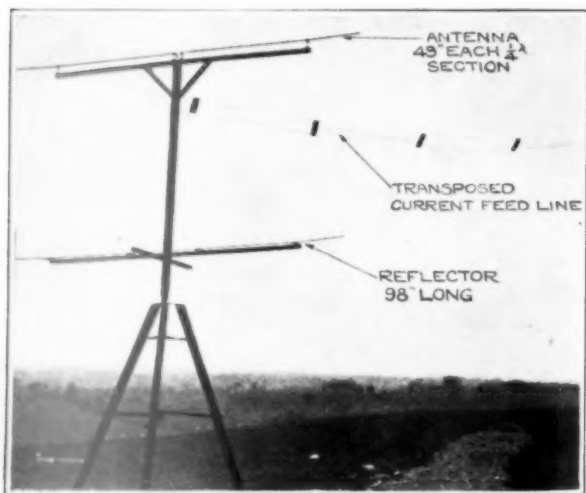


FIG. 1.— THE DIRECTIVE ANTENNA ASSEMBLY

The antenna and reflector are of quarter-inch diameter copper tubing supported on small stand-off insulators. The frame is of wood.

cuit works just as well at the lower frequencies as well. Fig. 2 shows the circuit with constants for 60 mc.

The next step is to couple the transmitter to the antenna. This is done by means of an ordinary twisted lamp cord. In experiments carried on at W8AZL, the amateur station at the Victor transmitter of WHAM, a cord 60 feet long was used to facilitate changing the position of the antenna.



THE DIRECTIVE ANTENNA FOR VERTICAL RADIATION

The two-wire spaced feeder system is usually replaced by a twisted pair.

No unusual loss was noticed by this comparatively long feeder. The antenna is current-fed at the center with the antenna ammeter placed in one section at the point where the feeder is connected. With input to the Type '10 at 15 watts, an antenna current of .3 amp. has been obtained.

With the transmitter feeding the antenna, we were naturally anxious to see what the outfit

sounded like. In the rush to find out, a regular regenerative receiver was tried. The carrier could be tuned in but the results from a receiving standpoint were very unsatisfactory. A special type of receiver had to be designed but we also kept in

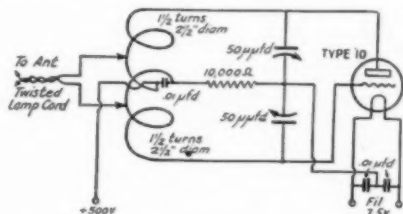


FIG. 2.— THE SPLIT COLPITTS TRANSMITTER CIRCUIT

A fixed blocking condenser is connected in the center of the inductance. No radio-frequency chokes are required in the grid return and d.c. plate supply circuits.

mind the fact that the average amateur does not have parts to make up several receivers. (That was not hard to do since we were just as average as the rest when it came to buying power.) Type '99 tubes had been used in the first receiver and, as anyone who has used these tubes knows, they were very microphonic. When used in a set in an automobile it was some job to get the noise level low enough to hear the signal.

At 56 mc. the voltage across the input of the detector is likely to be very low and it is necessary to get it as high as possible to make the receiver sensitive.² WSBHM designed an arrangement for the coil condenser of the detector so that we were able to put about twice as much inductance in the circuit as with the older method of mounting the parts. The arrangement is shown in the receiver illustration. Among the tubes that we tried were Types '99, '01-A, '12-A, '27, '24, W.E. 239-A, UX-240 and W.E. 102-E. The most satisfactory of the lot from a standpoint of quiet operation and simplicity was the Type '27 operated with d.c. on the heater, although a.c. may be used with good results on the 7- and 3.5-mc. bands. One stage of audio was used for headphone reception at all times, except when a

loudspeaker signal was wanted; then another external audio amplifier was used to give the necessary gain and power.

² The input (grid-filament) capacity of the tube becomes appreciable at such high frequencies. Push-pull detector circuits could be used to advantage in reducing the effective tube capacity and a series-tuned grid circuit is also advantageous in giving a high inductance-capacity ratio in the grid circuit. — Editor.

The circuit for the present regenerative set is shown in Fig. 3. The coils are mounted on a tube-base bottom and are self supporting. Five turns of No. 18 enameled wire are used and the coils are wound around an ordinary fountain pen about $\frac{3}{8}$ " in diameter. Fringe howl was encountered and was stopped by loading the secondary of the audio transformer with a $\frac{1}{2}$ meg. leak. This also cuts out considerable a.c. hum from the lighting circuit when using a.c. on the heaters. Bias for the audio stage is obtained from the voltage drop across the heaters. The positive "A" battery lead is connected to the cathodes. The heater leads are twisted so that if a.c. is used the hum will not be objectionable. The antenna is coupled to the receiver by two or three turns of wire (inductive coupling). Capacitive coupling gave quite a bit of hum when the receiver was located in the station near a.c. lines, while inductive coupling showed a decided absence of this trouble. Almost any kind of an antenna can be used for the receiver. If the receiver is used with the batteries at a distance from the ground connection, trouble is encountered with capacity effects when the hand is brought near the tuning dial. This can be eliminated by completely shielding the receiver and running the battery leads in a piece of BX flexible cable, or any other shielded cable.

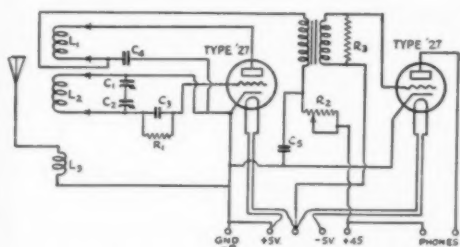
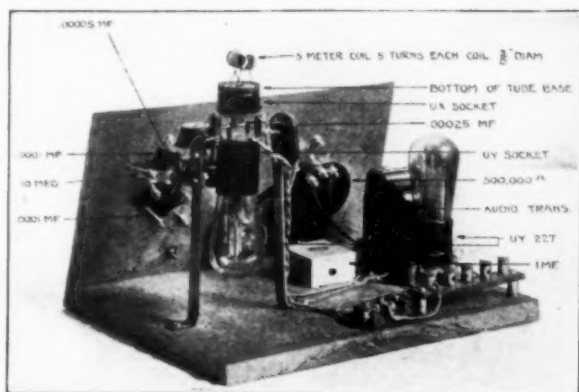


FIG. 3. — CIRCUIT OF THE 56-MC. AUTODYNE RECEIVER

- L_1 — Tickler. See text.
- L_2 — Grid coil. See text.
- L_3 — Antenna coil. See text.
- C_1 — 100- μ fd. midjet condenser.
- C_2 — 50- μ fd. midjet condenser.
- C_3 — 100- μ fd. grid condenser.
- C_4 — 250- μ fd. plate by-pass condenser.
- C_5 — 1- μ fd. by-pass condenser.
- R_1 — 10-megohm grid leak.
- R_2 — 500,000-ohm regeneration control resistor.
- R_3 — 0.5-megohm grid-leak type resistor.

During the summer of 1929, the 56-mc. set at WHAM was operated under the call W8XAC. Phone was used and a superheterodyne receiver was built to see how the quality was at this high

frequency. The results with the super were far superior to the ordinary regenerative set for telephone work, but it was much harder to build. The super was completely shielded and consisted of a Type '24 first detector, a Type '24 low frequency amplifier (30 kc.), a Type '27 second detector, and a Type '27 audio stage, operated from the six-volt storage battery in the car and 180



THE 56-MC. AUTODYNE RECEIVER

The 100- μ fd. tuning condenser is mounted on the panel and the 50- μ fd. midget is built into the detector assembly at the left. The plug-in coils are mounted on the bottom of a tube base. Two heater-type tubes are used with their filaments connected in series.

volts of "B" batteries. Music was received clearly in a car at a distance of 20 miles, with an antenna 5 feet long. Addition of an antenna 30 feet long gave such a strong signal that it blocked the second detector. This receiver has not been fully developed and we expect some real DX from it without impairing the quality when we get the thing up to maximum sensitivity.

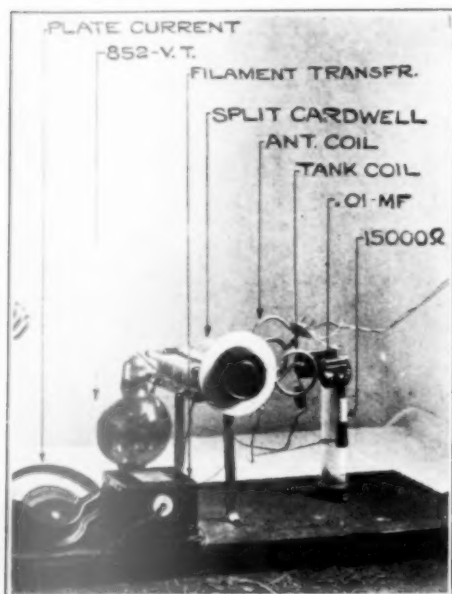
DUPLEX TELEPHONY

What will probably interest the amateur the most, is the story of a two-way 56-mc. duplex telephone conversation between WSAZL and WSPK. The ordinary regenerative receiver and the 7.5-watt transmitter described (with 350 volts and 50 ma. on the plate of a Type '10 and a modulator with the same power input) were used.

One night last summer, WSPK and myself were working on the 3500-ke. band with phone. The 56-mc. transmitter as WSAZL was running also and WSPK was trying to get it. Within two minutes after the 56-mc. transmitter was started, he picked it up and reported a very strong phone signal — much louder and clearer than the 3500 ke. phone — and a total lack of QRN or QRM. The 3500-ke. phone at WSAZL was then turned off and the 56-mc. set was used entirely. We worked that way for about a half hour, and QRM and QRN became so bad on WSPK's

3500-ke. phone that he had to resort to telegraph to tell me how the "5-meter" stuff was coming along. Finally he got disgusted with his phone and wanted to quit. Jokingly I said, "Come on over and get a five-meter set. Take it back and

of to balance out the hum but without much success. For ordinary phone work it is not bad enough to be of serious trouble. Using a battery filament supply increases the effective range, because it brings up the intelligibility quite a bit.



THE NEW 75-WATT TRANSMITTER AT WSAZL

A single-turn antenna coupling coil is used in this arrangement.

"I'll QSO you!" He took me up on it! I didn't like to back down on what I had proposed so I said, "O.K. Come on; I'll be building it while you are on the way over."

A split Cardwell condenser was all cut and ready, and the transmitter was literally thrown together. By the time he arrived, it was perking O.K. on the power supply that we had, which consisted of a Stromberg-Carlson 404 socket-power unit, wired as shown in Fig. 5. He took the transmitter and went back home, and we made a sked to QSO in an hour (it took a half-hour for him to get home).

At the end of the hour, I started tuning on the 56-mc. band and ran across his carrier right away. I got it tuned in good, and gave him a call. He came back, "O.K." Then for two hours we talked back and forth without a break. If you have never held a two-way conversation on phone with no QRM or QRN you still have one more thrill to get from amateur radio.

Later we improved the quality by using a battery on the filament of the oscillator. The filament with the a.c. flowing through it seems to act the same as an absorption loop and modulates the set. We tried everything that we had ever heard

DIRECTIVE TRANSMISSION

Reflectors were used to determine how much better the signal could be received when the energy was all concentrated in one direction. A half-wave rod was placed a quarter-wave behind the antenna, and this helped to some extent. Next we tried the Warner Splatter System by putting a reflector $\frac{1}{4}$ -wave under the antenna, the object being to project the wave straight up into the air. We got the surprise of our lives when the signal increased about double. We don't know what or where it splattered, but the results are such that we have been using this type of antenna ever since.³

Recently, we have started in to do some more work on this problem and by courtesy of WSAZY

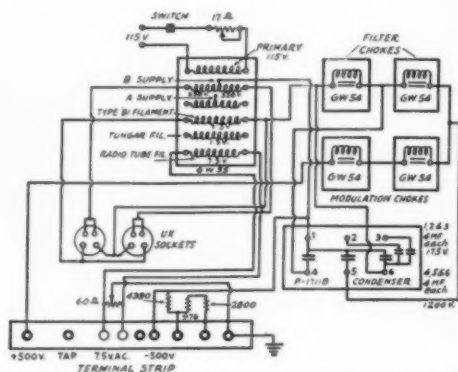


FIG. 4. — CIRCUIT OF THE CONVERTED STROMBERG-CARLSON 404 POWER PACK

The 6W-54 chokes are each rated at 22 henries, 300 ma., 20 ohms d.c. resistance. The d.c. output of the unit is 500 volts and the a.c. filament supply available for the transmitter is 7.5 volts.

we now have at our disposal his pet Type '52. It is running at the present time on 60 mc. at WSAZL and is shown in an illustration. We will run the set through the summer and would appreciate schedules from the gang who are interested in this band. At this time it offers only short distance phone communication but as our receivers and transmitters improve with use of the band, we may expect just as much from it in the line of thrills as any other band, and undoubtedly

(Continued on page 76)

³ Present theory would indicate that the maximum electron density in the upper atmosphere is generally insufficient to give such complete reflection — but theory isn't always puncture-proof and sometimes the layer is. — Editor.

With IPH in Mexico

High Adventure With a Portable in an Auto Caravan

By Bertram Sandham, W6EQF*

THE motorist is ever looking for new lands to conquer. The United States has already been thoroughly toured by automobilists who have the time and desire to wheel their cars over thousands of miles before turning homeward. Canada is much the same way. Her statistics on visiting motorists lend themselves well to painting the picture of the American motorist searching for new background, particularly where different customs of living are to be encountered and where romantic history abounds. Where, then, can the motorist now go without retracing his course?

To Mexico, our neighbor to the south of us, to be sure! But today the roads progress into that country but little before they become impassable. Investigation and, in fact, exploration are needed. Therefore, with physical obstructions considered, and with the element of safety and the state of mind of the people in the west coast states of Mexico as questions to be answered, the First International Pacific Highway Exploring Expedition was outfitted by the Automobile Club of Southern California with orders to proceed as far south as was humanly possible, or until the rains set in which would obviously render the ox-cart trails and lowlands impassable. If a highway through Mexico appeared to be feasible as an extension of the present Pacific Highway, reaching from British Columbia to the Mexican border, why should it not continue on into Central America, Panama and the many countries of the southern continent? Thus, the International Pacific Highway was conceived and will some day be completed. It will run a course from Fairbanks, Alaska, on the north, on down to Argentina, ending at Buenos Aires on the Atlantic coast, 12,000 miles in length and the longest highway in the world.

As a member of this expedition I was in charge of a portable high-frequency radio station which operated under the call IPH.

When it was decided to include radio in the equipment of the expedition, but ten days remained before the departure. In that space of time the portable transmitter and receiver, in a single carrying case, had to be designed and built, spare parts accumulated, reliable schedules arranged, a portable mast built, an extra storage battery hung beneath the rear floorboards of the car with suitable switches for throwing both

batteries on charge or in series for the transmitter. Added to this my own personal equipment had to be assembled. It was a busy ten days.

The radio unit was designed and built by W6QF, put in final shape and tested by W6FE and myself. The transmitter consisted of two Type '10's in parallel in a t.p.t.g. circuit with



IPH IN OPERATION AT ELOTA

The set-up here is in the public square with the Zepp swung from a balcony in the temple.

high-C, so that the frequency might be shifted from the 7000- to the 14,000-kc. band without changing coils. The receiver was a conventional autodyne with two stages of audio. A reel was provided to carry the two antennas wound over it, one for either band and built particularly for the lower portion of the 7000-kc. band and the upper part of the 14,000-kc. band. A large waterproof box was built and installed between the front and rear seats of the radio car and in this, fourteen 45-volt "B" batteries were packed, two being for the receiver, and the remainder for transmitter plate supply. A long 7-wire cable conducted the various voltages from the box to the transmitter in the tent, or wherever it happened to be set up. A portable table and camping chair completed the radio equipment. Sturdiness was the paramount consideration in the construction of the unit. Every part was solidly anchored and all connections well soldered. How wise the extra effort in this regard, for the radio equipment took a terrific thrashing and was almost a daily

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subject for discussion. We all wondered at the end of a day's pounding how much of the unit remained intact. Despite the well-soldered joints, they were broken loose occasionally.

The expedition, consisting of nine men in five cars, departed from the club building in Los Angeles on March 15th in a heavy downpour of rain. A motorcycle police and aerial convoy had to be dispensed with because of the inclement weather, and we turned toward the Mexican border via San Diego, Imperial Valley, Yuma,



THE AUTHOR WITH MEXICAN BODYGUARD

The bodyguard was necessary through the bad country. The Mex is the walking arsenal at the left.

and Nogales. Heavy rains preceded us the entire distance to Nogales, resulting in our being hours late at official functions along the line.

Three of the cars were light trucks with heavy special bodies built for the purpose. Complete equipment of every nature was included for the well-being of the men and the countless problems that would face the expedition's mechanic and engineers. Compartments back of the driver's seats were both water and fireproof, containing motion picture and "still" equipment, delicate engineering instruments, ammunition for the rifles and automatics, tobacco, and so on. The remaining two cars were of the touring variety, open and heavily loaded. Truck springs had to be substituted in them to bear the heavy load. One of these was the radio car which, in addition to the batteries and all radio equipment, had baggage

jammed in every available space and a long rifle locker fastened along the top of the seat just at the driver's back. The other touring car, in addition to baggage, had mounted in it two compasses, altimeter, grademeter, special mileage recorder and other appurtenances necessary for this branch of the work. A road chartman sat before these instruments and noted every mile of the road below the border in a chartbook, showing bridges when encountered, with the direction of flow of the water, topography of the mountains or adjacent land, isolated churches or structures for identification to the tourist later, all roads branching off or crossing, with mileages between them, per cent of grade, and the altitudes of all cities encountered, with mileages between them also. Notes were made of gasoline stations, etc. In fact a complete record of use to engineer and tourist alike returned with us.

Just across the Mexican border at Nogales, the portable was rigged and IPH went on the air officially for the first time. Conditions were discouraging for our purpose, as all Pacific Coast signals faded after 8 p.m., M.S.T. Central and eastern U. S. signals, however, seemed to boom in constantly. It was soon learned that all of the expedition's traffic would have to be disposed of on a morning schedule only, as long as the 7000-kc. band remained good. As the set was rigged at Nogales, the Mexican mayor, the special representative of the Governor of Sonora and other officials began filing messages in Spanish as rapidly as they could write them — traffic that we heretofore had not anticipated. Had it not



SCORES OF MILES OF THIS TYPE OF COUNTRY HAD TO BE COVERED

The caravan often went over country never travelled before by automobile; mapping the country for a future international highway.

started to rain I believe I should still be sitting in the center of a street in Nogales pounding out their messages.

A correspondent of the North American Newspaper Alliance, representing 51 of the largest dailies in the country, was with us, and consequently his press had to go through. That which he filed with me the first night at Nogales had to be sent to Los Angeles via Honolulu, although

we were but 600 miles distant. All signals along the Pacific had faded for the night, yet K6 signals came in R6. After several days' layover at Nogales to permit the dirt road to dry up somewhat, we started into Mexico in earnest and the battle was on. The many odd experiences encountered along the line of travel would require many pages to recount, so only the highlights can be included.

A task that became exceedingly tiresome was the locating of a suitable building or flagpole in each city or village to support the antenna. At one time or another we used ice plants, breweries, flour mills, cathedrals, penitentiaries, city halls, weather observatories, governors' palaces and state buildings. The portable mast was used only when the expedition was in camp. What appeared to be a perfectly suitable QRA from the distance, as we entered town, would usually prove worthless as a telephone pole nearby probably supported a bank of heavily overloaded and buzzing transformers. In some cities the electric light wires hung so low that women hung their washings on them!

As a rule great crowds of natives would form a circle about the transmitter during schedules, never having seen a radio set before — in fact many of the children in the more isolated towns had probably never seen an automobile. In

and there are millions of them in Mexico, all of the nondescript breeds — would occasionally snap at my heels as I sat at the transmitter.

At Navajoa a burro lazily made his way up to my side and, flipping his upper lip several times, started to eat the power cable running to the car.



THE AUTHOR, STATION AND RADIO CAR

This shows a typical country set-up. The transmitter and receiver are enclosed within the carrying case atop the portable table.

At Guamachil, I felt a warm draught of air on my neck and turned in my chair to face an immense long-horned bull with his horns encircling my head like a halo. I thought that would be the last schedule. At Santiago several soldiers endeavored to detour a flock of pigs around my QRA, but managed to get them in such a frame of mind that the only way out was beneath my table and chair.

With my limited knowledge of Spanish and the natives' lack of English, the placing of the antenna on a building usually required an hour. A rope was handed one and a definite place decided upon to fasten it, but the native would invariably appear at the wrong window or church spire. In throwing the rope down (to which I would fasten the Zepp) it never failed to become entangled in whatever lay below it. In one instance the native threw the coil of rope down into the street, not knowing that he was to retain one end of it. After the antenna was secured finally, the Mexicans, on several occasions, thought the antenna should be as tight as a guitar E-string, and would give a

final jerk that would send me leaping to the set to prevent it being pulled from the table.

At Guadalajara a tall metal pole at the weather observatory was used, in lieu of anything better. Three power leaks from loose electric wires could



CROSSING THE CULICAN RIVER

The equipment had to be ferried across on extremely crude wooden boats. Crossing rivers this way was a common occurrence. Streams were forded with the water up to the doors of the cars. Quicksand claimed vehicles as victims every so often, whereupon cables and hoists were attached and the trapped vehicle yanked to safety.

larger cities police or soldiers would keep the curious some distance from our set-up, but in the smaller towns difficulty was experienced many times with the natives standing at my elbows and all jabbering furiously. The infuriated dogs —

be seen from this QRA and heard R9. Four other power leaks could be seen from my hotel window in the same city. In the hotel lobby I had quite a conversation with a Mexican general on various subjects. He neglected to inform me, as I later learned, that he himself had executed some 300 priests during the religious difficulties a year or so ago.

At Hermosillo I had the good fortune to meet X29A who, with a friend of his (who owned a brewery), took me in tow during our visit in that city.

In Mexico City, which has a population of more than a million, an entire afternoon was spent



CHALLENGING A STRANGER IN CAMP IN THE BARRANCAS

Through this country the cars occasionally had to be towed by ox-teams.

endeavoring to find a suitable location for the set-up. An oil derrick was finally chosen and the portable rested about fifty feet from a boiler and steam engine. Mechanical QRM, however, was much preferred to the collection of electrical noises that could be heard elsewhere. A drive of about five miles from the hotel to the oil derrick was necessary. There are thousands of automobiles in this city, and the traffic control system was such that when I arrived at my QRA for skeds I didn't care whether school kept or not. It is necessary to proceed along the extreme right-hand side of the street to make a left-hand turn, and *vice-versa*. When the signal is given there is a grand dash of pleasure cars, trucks, buses and street cars into the intersection, where all of them dove-tail and cross each other's bows. I would finally extricate myself from one of these messes to find that I was going the wrong way on a one-way street. Police whistles would fill the air after me, but I wouldn't know how many laws had been broken, so I kept going. I had to choose a different route each day, however, to keep out of jail. Cars pass you on both the right and left sides. When you hear a horn to the rear you just drive straight ahead and pray. You must sound your horn at every intersection, and you are stopped quite frequently and must display your driver's license and car registration certificate.

The rains began again, and it was found that travel from Mexico City into Central America would have to be postponed until a more favorable season next year. IPH went off the air after

a week in Mexico City, and preparations were made for the drive back to Los Angeles over a road paralleling the Atlantic coast and over which no skeds need be kept. This road entered the United States at Laredo, Texas, necessitating a drive across this state, New Mexico, Arizona and California to reach home — where finally ended one of the hardest drives ever attempted by an automobile caravan, and probably the first expedition of such a nature to be equipped with a radio transmitter.

Keeping the expedition in touch with the world by radio was but a part of my duties with the expedition. Piloting one of the cars through the day over roads that could hardly be called roads, and attending functions of various descriptions in cities consumed the balance of the time. We arrived in cities anywhere from 8 p.m. to 4 a.m., in some instances having but one hour of sleep in forty-eight. This night driving also precluded any evening radio schedule unless we laid over several days.

Crossing the barrancas of Jalisco, better described as several Grand Canyons scrambled in all directions, was indeed a task. But two cars were risked through this country, the radio car and the supply cars being loaded on the railroad and sent through on the S. P. Lines. As we camped on the brink of the barrancas for three days to make preliminary surveys by foot, before a decision was reached, I concluded that one car would be lost over the precipice in descending and



BLAZING TRAIL FOR THE CARAVAN OVER DRIED UP RIVER BEDS AND MOUNTAIN RANGES

The rocky parts were dangerous, as each rock moved held the menace of a deadly alacrana or scorpion, or the even more deadly tarantula.

that an entire day would be consumed in turning the other car around in the road so that it could be dragged out by oxen. The road we were taking was one used five hundred years ago to haul Spanish treasure from San Blas to the Atlantic

(Continued on page 72)

Bringing Frequency Measurement Up to Date

The Development of a New Type Frequency Meter

By George Grammer, Assistant Technical Editor

ONE problem of amateur radio today is that of using our frequency bands to the fullest possible extent, but without exceeding their limits. *QST* has devoted thousands of words and scores of pages to discussions on frequency precision and practical means of obtaining it; nevertheless, there are still numberless amateurs who have not yet grasped the fact that accuracy of frequency measurement is of vital importance to every one operating a transmitter and is certain to become more important as time goes on.

Measurement of frequency "to within 0.1%" (or even $\frac{1}{4}\%$ or 1%) is not something purely arithmetical, to be left to the other fellow to play with if he likes that sort of thing; it is not simply one of those things which the experimenter gets a kick out of doing; it is of most importance to the practical brasspounder, because the amount of frequency "territory" he has available for operation is dependent upon the precision of his frequency-measuring equipment as well as upon the legal limits of the amateur bands.

This does not mean that an amateur is not entitled to use all of a band simply because his frequency measuring equipment is not up to present-day standards. The bands are open to the fellow without a frequency meter as well as to the one who has a primary standard at his elbow. But it does mean that the tuning of the transmitter is restricted to those portions of the band in which the error in frequency measurement cannot result in the transmitter's being off-wave.

The reason for this should be apparent. The actual frequency of a transmitter will lie on either side of that indicated by the frequency meter, and the amount of deviation is directly proportional to the percentage error of measurement. The transmitter, therefore, must be set to an indicated frequency sufficiently removed from either edge of a band so that, allowing for error in measurement, the actual frequency will not be outside the band. A station assigned a spot frequency might legally "wander" within small limits, which limits are becoming narrower and narrower as progress is made in the development of frequency stability of oscillators and precision of measurement. Amateurs, however, are assigned bands of frequencies, and there are no frequency tolerances for services which are assigned bands. Translated into operating practicality, this means that the width of a band is

something less than the number of kilocycles specified by the regulations. It is up to the individual amateur to say how much of each band he loses, because the loss is proportional to the error in his frequency measurements.

Let us see how it works out. Suppose a transmitter is to be set to some frequency within the limits of the 7000-kc. band. A frequency meter is available which permits measurement of frequency with an error of not more than 1% — a fair estimate for an absorption-type meter. (Accuracy of measurement is something entirely different from accuracy of calibration with some meters; but more about that later on.) To be certain that the transmitter is working inside the 7000-kc. band the operating frequency as read by the meter must be between 7070 and 7228 kc. This in effect reduces the size of the band to 158 kc. — a loss of almost 50%. If the percentage error in measurement can be reduced to 0.1%, the useable limits will be widened to 7007 and 7293 kc. (an effective width of 286 kc.), representing a loss of less than 5%. In the former case the transmitter could not be set by the meter to frequencies between 7000 and 7070 kc. or between 7227 and 7300 kc. with any assurance of tuning within the legal assignments. In the second case the portion of the band which cannot be safely used is considerably smaller. The chart, Fig. 1, shows the limits of tuning in each band as set by the accuracy of frequency measurement.

Evidently there is an intensely practical need for accuracy of a high order in frequency measurement if the full width of each of our bands is to be intentionally utilized without danger of overstepping the edges. But just what is the accuracy of measurement which the average amateur can hope to attain, and how can it be accomplished? One thing is certain; we cannot afford to sacrifice any of our precious operating territory simply because we are unable to determine with our frequency-measuring devices just where that territory lies.

LIMITATIONS OF ABSORPTION METERS

The old absorption meter — so called because the energy which actuates its resonance indicator must be absorbed from the source of oscillation whose frequency is being measured — with its calibrated coil and condenser, and flashlight bulb, neon lamp, thermo-galvano meter or rectifier indicating device, has outlived its usefulness in

the amateur field. It is inherently a comparatively low-precision device — not because a coil and condenser cannot hold a calibration if carefully handled, but because the functioning of such an instrument depends upon magnetic or electrostatic coupling to the circuit being measured, and this coupling cannot be secured without affecting the tuning of both the source of oscillations and the meter — to the detriment of accurate measurement. An absorption meter might be calibrated to a high degree of accuracy — yet under any conditions differing from those under which it was calibrated the readings would be "off." The faith which some amateurs have in absorption meters either purchased with an accurate calibration or home-calibrated from standard frequency signals is as pathetic as it is misguided. And this in spite of the fact that everyone who has ever used these meters knows that a small difference in the coupling between the meter and the source of oscillation will make a noticeable difference in the scale reading.¹

Such meters may be successfully used when they are sufficiently sensitive to give an indication several feet away from a transmitter, although even then there is a possible source of error from hand capacity unless the meter is shielded from the operator's body. Unfortunately, such a meter cannot be calibrated or checked easily from standard frequency signals with such loose coupling — at least we

have never seen one which would give a good "click" several feet away from the receiver. The answer to the last problem is to mount the meter permanently near to the receiver with a

fixed degree of coupling and the calibration will hold. However, it can't be moved near the transmitter in that case and so is of no value in measuring transmitter frequency unless used in conjunction with a monitor as suggested previously in QST. This is the best method of using it, but still is not good enough, because it is difficult to accurately calibrate the meter to the required degree of precision — in fact, the monitor itself is likely to be a better frequency meter. Clicks or stoppage of receiver oscillation are not sufficiently positive for real precision of calibration or reading, although much better (when the coupling is the loosest possible) than any form of resonance indicator introduced into the tuned circuit or coupled to it. Unless the resonance indicator is extremely sensitive it will considerably broaden the tuning of a circuit which is already a great deal broader than desired, even though the best of coils and condensers are used.

The absorption meter thus falls short not only of the ideal frequency meter, but far below the working standards necessary for the accuracy of measurement required today. Its calibration is only good under certain fixed conditions which are almost never duplicated by amateurs in practice; readings are never as accurate

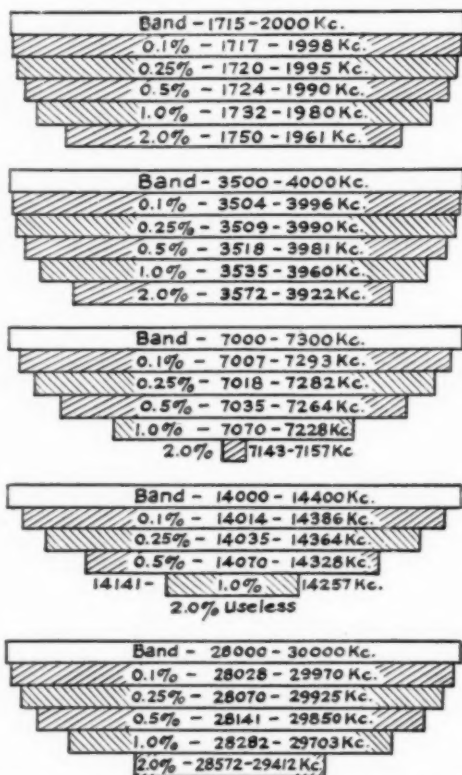


FIG. 1. — THIS CHART SHOWS GRAPHICALLY HOW TRANSMITTER TUNING IN THE DIFFERENT BANDS IS LIMITED BY THE ERROR IN FREQUENCY MEASUREMENT

Readings which cannot be guaranteed to closer than 2% in the 7000-kc. band limit the tuning to frequencies between 7143 and 7157 kc., because a setting on either side of these frequencies is likely to be outside the band. The same meter would be absolutely useless on 14,000 kc.

Absorption meters, with careful handling and a sensitive indicating device, will ordinarily give readings which are in error by two or three times the error in calibration; that is, a meter calibrated to 0.25% can be depended upon to give indications with a transmitter which will be within 0.5% or 0.75% of the actual frequency. Neon-tube and flashlight-bulb indicators are not sufficiently sensitive or sharp to stay within these limits. Readings with such indicators are often "off" as much as four or five times the error in calibration.

The following table is a fair estimate of the accuracy of different types of meters in practice:

- 0.1% — A good, stable heterodyne meter of the dynatron type.
- 0.25% — Heterodyne meter with an ordinary oscillator, or a precision absorption meter calibrated to 0.01%.
- 0.5% — Absorption meter with sensitive indicator, calibrated to 0.25%.
- 1.0% — A good absorption meter with neon-tube or flashlight indicator calibrated to 0.25%.
- 2.0% — Same type of absorption meter calibrated to 0.5%.

¹ QST, October, 1928, page 14.

as the original calibration, and often do not even approach the calibrated precision; it is never sufficiently sensitive to give a satisfactory indication of resonance with "zero" coupling, or coupling so loose as to have no effect on the readings; the resonance indications are far too broad for precision work — flashlight bulbs and neon lamps are hopeless, and even indications from galvanometers and milliammeters are not sharply defined; in fact, its sole recommendations seem to be ease of construction and cheapness — and even on the latter count it is far from being inexpensive if a sensitive resonance indicator is used.

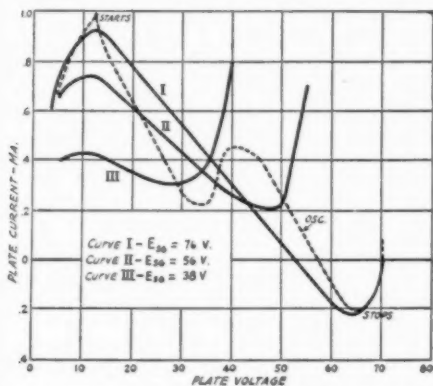


FIG. 2. — TYPICAL DYNATRON CURVES OF A TYPE 22 TUBE

The plate resistance is negative over a portion of each curve, as indicated by the decrease in plate current as the plate voltage is raised. It is equal to the slope of the line in each case. Curve I gives a value of approximately 42,000 ohms, Curve II about 56,800 ohms, and curve III about 11,900 ohms.

The dotted curve was taken with the voltages of Curve I, but with the tube oscillating at about 3600 kc. No explanation has been evolved for the "hump" in the center of the curve, although it is possible that the use of resistance to vary the plate voltage may have had something to do with it. The hump had no noticeable effect on the frequency of oscillation, which varied uniformly as the voltage was increased.

As such meters are ordinarily used, the error in readings is often several times the percentage error in calibration. A meter calibrated to within $\frac{1}{4}\%$ rarely gives readings of that accuracy in the hands of the average amateur; $\frac{1}{2}\%$ would be excellent, and 1% probably would be about representative. Which reminds us of one phone ham who was logged on 3600 kc. and couldn't understand it at all. He had a "good" meter that was guaranteed to be within $\frac{1}{4}\%$ and it showed he was in the middle of the 'phone band. Of course he had to jam the meter right inside the inductance on his modulated Hartley to get a good reading, but what of that? The calibration was guaranteed, wasn't it?

DESIRABLE CHARACTERISTICS FOR A FREQUENCY METER

The meter which meets practical needs must be one which can be calibrated and used with

coupling so loose that its calibration is unaffected; it must be capable of holding that calibration within very small limits over a considerable period of time; and it must give positive and extremely sharp indications. The characteristics of the heterodyne frequency meter most nearly approach these conditions. The sensitivity is great enough to allow the use of coupling so loose that neither receiver nor transmitter can affect the calibration. The zero beat method of reading is so sharp that the frequency can be read to within a few cycles. The vacuum-tube oscillator, when properly designed, will hold calibration to a fairly high degree of constancy — in fact, with an oscillator which is only fair in this respect it is possible to attain a much higher degree of accuracy than with the best of amateur absorption-type meters. Practically any oscillator built with ordinary care is capable of holding calibration — and at the same time capable of being read to within $\frac{1}{4}\%$ of the calibrated accuracy under reasonable conditions of use. A cheap calibrated monitor is better than an absorption meter unless one wishes to pay a few hundred dollars for special meters such as are used with high-power transmitters — which incidentally lose a great deal of their accuracy with low-power sets.

But a simple ordinary oscillator, even though better than an absorption meter, is not good enough. When a fair degree of accuracy is to be attained, minute changes in calibration cannot be lightly ignored. There is a vast difference between attaining an accuracy within 0.5% and within 0.1% — a difference of much more than 5 to 1, as the figures would indicate. Oscillator frequency stability of the order of a few hundred cycles about a mean frequency is much harder to obtain than stability of the order of a few kilocycles (at amateur frequencies) — so much so that such things as tube and room temperature make noticeable differences. The constancy of the plate and filament supplies becomes of increasing importance.

At low radio frequencies it is possible to build a tube oscillator which will maintain its frequency to 1 part in 10,000 or better, but this becomes increasingly difficult at 3000 kilocycles and higher because the effect of tube characteristics — the most variable elements in the circuit — becomes more pronounced. With careful construction and a high-C circuit, however, a satisfactory oscillator can be constructed. A heterodyne frequency meter of this type has already been described in QST.² At frequencies higher than 3500 kc., however, the high capacity required for stability makes oscillation difficult, and at the same time harmonics are weakened by the high-C circuit so that the 3500-kc. oscillator will not always give satisfactory harmonic signal strength on the 7000- and 14,000-kc. bands. In addition, there are

² "A High-C Heterodyne Frequency Meter," QST, November, 1929.

constructional difficulties involved in getting the right values of fixed condenser capacities and grid leak resistance, and adjusting the tickler for smooth oscillation over the entire band without too-weak oscillation at one end and too-strong oscillation at the other.

A BETTER TYPE OF OSCILLATOR

There is another type of oscillator, however, which is free from these objectionable features — the pliodynatron or dynatron. Although not new in principle, since information on it was first published about twelve years ago, it has been largely neglected because of lack of vacuum tubes which had a suitable negative resistance charac-

oscillator circuit consists simply of a coil and condenser — no tickler, grid leak or blocking condensers are required. No juggling of tickler or grid coil turns to secure band-spreading and smooth oscillation simultaneously is necessary. The thing simply oscillates or doesn't — depending on the negative resistance of the tube and the parallel impedance of the tuned circuit. The construction of an oscillator of this type is so easy that even if it had no other advantages over the ordinary tube oscillator this point alone would recommend it.

The screen-grid type tubes have a pronounced negative-resistance characteristic over a portion of their plate characteristics.⁴ Both the Type '22 and Type '24 tubes are good oscillators at frequencies of 3500 kc. and even higher. It is sometimes hard to get dynatron oscillators to function at frequencies higher than 10,000 kc. because of the difficulty of building tuned circuits of sufficiently high impedance, but since good practice in heterodyne frequency meter design dictates the use of the lowest frequency band to be covered as the oscillator frequency, and the use of harmonics for the higher bands, this obstacle is immaterial. The frequency meter may cover the 3500-kc. band and the second and fourth harmonics will take care of the other two most popular bands.

With the dynatron oscillator it is possible to use a lower C/L ratio for good frequency stability than with the ordinary tube oscillator, which removes the objection to loss of harmonics with high- C circuits. A small amount of fixed capacity in the tuned circuit is beneficial, but it need not be so large as to decrease the strength of harmonics.

Summing up, the points of superiority of the dynatron oscillator over the ordinary tube oscillator are these: first, it is more stable; second, harmonic strength can be secured without loss of stability; third, construction is much simpler; fourth, it is possible to have a constant check on the operation of the meter, as will be explained later, which eliminates the effects of aging of batteries and decrease of filament emission during the useful life of the tube; fifth, less apparatus is required than with the tube oscillator, decreasing the number of elements in the meter which can for various reasons change the calibration with time.

SUITABLE TUBES

While the screen-grid tubes exhibit the best dynatron characteristics of tubes available at present, they are by no means the only ones which do so. Some triodes also show a negative-resistance characteristic, although they are less uni-

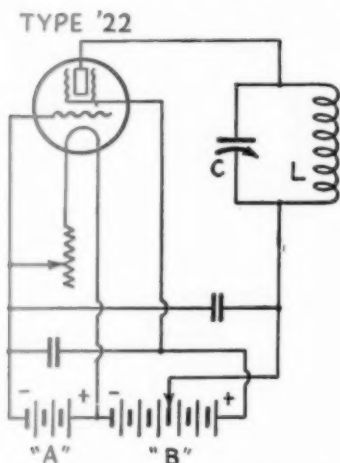


FIG. 3. — THE DYNATRON OSCILLATOR CIRCUIT

The frequency of oscillation is determined chiefly by the inductance L and condenser C . The other two condensers are used to maintain the screen grid and lower end of the tank circuit at the same r.f. potential as the filament, and should be rather large (0.5 to 1.0 μ fd.) by-pass condensers.

Oscillations will start when the negative resistance of the tube is equal to or less than the parallel impedance of the tuned circuit. In simple language the losses of the tuned circuit are "wiped out" by the negative resistance of the tube, and once the oscillations are set up — as they will be if there is only a very minute change in plate current — they will continue so long as the negative resistance is maintained at the proper value. The amplitude of oscillation will be determined by the value of the negative resistance and the operating limits of the tube.

teristic.³ It is a very stable oscillator when lightly loaded, although few of the tubes now available are capable of developing an appreciable amount of power without loss of stability. However, no power is taken from a frequency meter, so the desirability of the dynatron for such a purpose is not lessened on account of low power output.

Aside from the fact that it is comparatively easy to build a dynatron oscillator which will maintain frequency stability better than a good tube oscillator of ordinary type, the whole constructional job is greatly simplified. The

³ "The Dynatron," *QST*, February, 1930.

⁴ The four-element tube more properly should be called a "pliodynatron" when its dynatron characteristic is utilized. However, the distinction is quite academic and the term "dynatron" may be used.

form in this respect than the screen-grid tubes. Several tubes of the '71-A type made by one manufacturer were excellent dynatron oscillators in some tests made in the laboratory, while other '71-A's of different manufacture could not be made to oscillate. Other three-electrode tubes behaved similarly. On the other hand, we have yet to find a screen-grid tube which would not oscillate, although some are better than others.

After a number of tests of both Type '22 and '24 tubes as dynatron oscillators, it was finally decided that the '22 was more suitable for frequency meter use. To those who are familiar with the dynatron characteristics of these two types of tubes this decision may at first glance seem a little odd, since the '24 has a much lower negative resistance than the '22 and therefore is a better oscillator. For frequency stability, however, the negative resistance should be high. This follows from the equation for the frequency of oscillation, which is

$$f = \frac{1}{2\pi} \sqrt{\frac{1}{LC} - \left(\frac{R}{2L} - \frac{1}{2\bar{r}C} \right)^2}$$

where L and C are the inductance and capacity of the tuned circuit, R is the resistance of the tuned circuit, and \bar{r} is the negative resistance of the dynatron.⁵ The values of L , C and R will not change appreciably in a practical circuit if the coil and condenser are of good solid construction and if no extraneous material (not a part of the meter) is introduced into the field of either the coil or condenser. Temperature changes will have some effect on these quantities and so the temperature should be constant for best stability. However, this effect is smaller than some others which cannot be well avoided and is not bothersome unless the change in temperature is greater than that encountered in an ordinary room.

The negative resistance of the dynatron is subject to variation from changes in battery voltage, grid bias and filament emission, and these variations must be kept to a minimum if the oscillator is to be stable. Since \bar{r} appears only in the denominator of the last term of the equation, it is evident that the larger \bar{r} is made the smaller will be that term, and consequently small variations in negative resistance will have less effect on the frequency than if \bar{r} were small. There is a practical limit beyond which \bar{r} cannot be increased, however, because if it is greater than the

parallel impedance of the tuned circuit $\frac{L}{CR}$

the circuit will not oscillate. The quantity $\frac{L}{CR}$

must, therefore, be made as large as practicable, which can be done by using a large inductance and small capacity and keeping the resistance

low by the use of a good coil and condenser. The quantity C , however, includes the capacity between the plate and screen grid of the tube, which is quite likely to change somewhat as the tube warms up, giving rise to frequency drift. Therefore a compromise must be made which will allow the use of such values of \bar{r} and C as will give good dynamic stability with a minimum of frequency drift. In practice the quantities can be worked out in such proportions that the frequency will drift less than 1000 cycles at 3500 kc., even starting with the tube cold. The Type '22 is noticeably better than the '24 in this respect; it operates at much lower filament temperature, which greatly reduces the time required for the

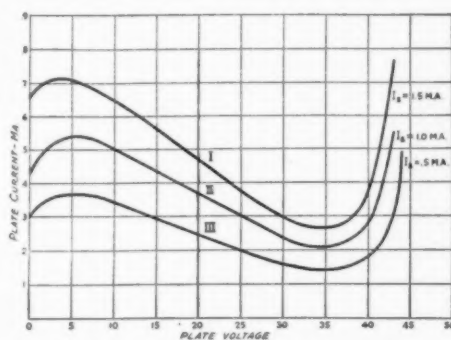


FIG. 4. — VARIATION OF NEGATIVE RESISTANCE WITH CONSTANT SPACE CURRENT

The screen-grid voltage is fixed, and the space current, I_a , changed either by variation of filament emission or grid bias.

tube to reach its operating temperature and thus reduces the time during which the frequency drifts, and at the same time the amount of drift during warming up is less than with the '24 because the smaller amount of heat developed results in less expansion of the tube elements and therefore smaller capacity change.

After the proper constants have been decided upon, there is still the problem of maintaining the negative resistance of the tube at a constant value. One method would be to keep plate voltage, screen-grid voltage, filament emission and control-grid bias constant. The tube is more sensitive to changes in filament emission and bias voltage than to changes in plate or screen-grid voltages, but the latter affect the frequency sufficiently to require a constancy of the order of a few per cent to be within the allowable limits. This would make the use of several voltmeters necessary and increase the expense unduly. Fortunately — and this is yet another point of superiority of the dynatron over the ordinary tube oscillator — a single inexpensive milliammeter provides a visual indication of the operating conditions if connected in the circuit so that it reads the total current furnished by the "B" battery.

A glance at the curves of Fig. 4 (taken from

⁵ A. W. Hull, "The Dynatron," Proc. I.R.E., February, 1918.

July QST⁶) shows that with fixed screen-grid and plate voltage the negative resistance is a function of the total space current. It seemed that this relation also should hold with different screen-grid and plate voltages if the ratio between the two voltages was held constant. Measurements were taken on a number of tubes of differ-

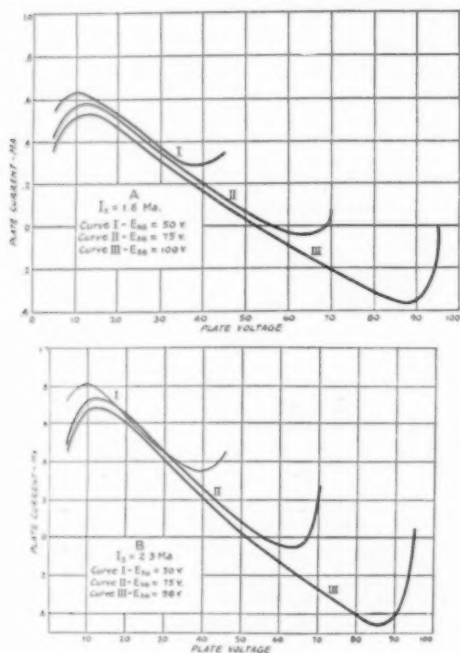


FIG. 5

The curves illustrate the point brought out in the text — that the negative resistance is approximately constant so long as the ratio of screen-grid voltage to plate voltage is unchanged, provided the total space current to the filament is constant.

In Chart A the space current, I_s , is fixed at 1.8 ma. The straight portions of the curves are parallel, indicating that the negative resistance is the same in each case. In Chart B I_s is 2.3 ma. The same relation holds for the higher plate and screen-grid voltages but shows signs of variation at the lowest voltage. For least variation, therefore, the plate and screen-grid voltages should be comparatively high and I_s comparatively low. This relation results in greater amplitude of oscillation and low filament emission, both of which are desirable.

ent manufacture and this was found to be true within rather wide limits of changes in actual voltages so long as the ratio between them was nearly constant. Values of filament voltage and control-grid bias were immaterial so long as the space current was fixed at a convenient value and held there. The curves of Fig. 5 for a typical tube illustrate this. A low-range milliammeter inserted in the negative "B" lead provides a ready indication of the conditions in the tube, and if the space current is always maintained at the value at which the oscillator was calibrated,

the calibration will hold. Adjustment of the filament rheostat or grid bias to maintain the correct value will compensate for loss of voltage in the batteries with age, and also for loss of emission during the life of the tube. Actual tests by beating the dynatron oscillator against a crystal-controlled oscillator and varying the screen-grid and plate voltages on the dynatron confirmed this. With changes in voltage of the order of 25% (representative of the usual drop in battery voltage during useful life) the frequency never changed more than 250 or 300 cycles — less than 0.01%.

A PRACTICAL STANDARD OF PRECISION

We can now answer with some degree of certainty the question raised at the beginning of this article — what degree of accuracy in frequency measurement the average amateur can hope to reach. With a maximum variation of frequency from all causes in a well-constructed dynatron oscillator of less than 1300 cycles at 3500 kc. it is possible to make a few simple calculations which will indicate the accuracy which can be expected. Oscillator vagaries represent a frequency variation of the order of 0.04%. With a good vernier dial which can be read to a tenth of a scale division (100-division scale) it is possible to return to within 600 cycles of a previous setting if the band is spread over 85% of the scale, representing a possible error of 0.02%. Standard frequency transmissions are within 0.01% of the frequency announced at the time of transmission. The sum of these possible errors — which in some cases may cancel each other instead of being additive — is 0.07%. No allowance has been made for errors in getting zero beat settings either in calibration or taking readings, for with reasonable care these will be so small as to be negligible. Even with a little allowance for errors which may creep in from other causes the useful accuracy with an intelligently operated, well-constructed meter will be within 0.1%, which is a very good standard for amateurs to set for themselves — and better accuracy than this is entirely possible.

An idea of just what such accuracy means can be gained by considering that it is possible to set the receiver by the frequency meter to pick up a signal of known frequency which, when heard, will be within beat-note audibility on the 3500- and 7000-kc. bands, and possibly also on 14,000 kc. Accuracy to within 0.1% is the least which can be tolerated if the edges of our bands are to be as fully utilized as the centers, and at the same time represents a good working standard for the average amateur. Undoubtedly some will be able to better this figure considerably — the standard frequency transmissions are ten times as good and are there for everyone's use. Improvements in oscillator stability and methods of resetting

(Continued on page 35)

⁶ "Impedance Measurement With the Phidynatron," page 39, QST, July, 1930.

The QST Lab. Capacity Bridge

By Beverly Dudley*

TO the experimentally inclined radio amateur the multitudinous uses of a capacity bridge are at once apparent. A capacity bridge is also a useful adjunct to the equipment of the amateur interested in the less technical side of radio communication. With it he can determine not only the maximum and minimum capacity of the tuning condenser in his receiver, but also the actual total circuit capacity including the capacity of the wiring, socket and associated apparatus. The correct size of the grid and plate blocking condenser to insure best operation in a transmitter may be measured; the useful capacity of the transmitter tuning condenser may be checked to determine whether or not the transmitter is actually high-C or not. Condensers may be aligned and checked in the broadcast receiver when necessary, and by doing a good turn for the BCL the amateur is less likely to be bothered by telephone calls reporting the "peculiar clicks which break up the program from WTIC." But these are only some of the uses of the capacity bridge.

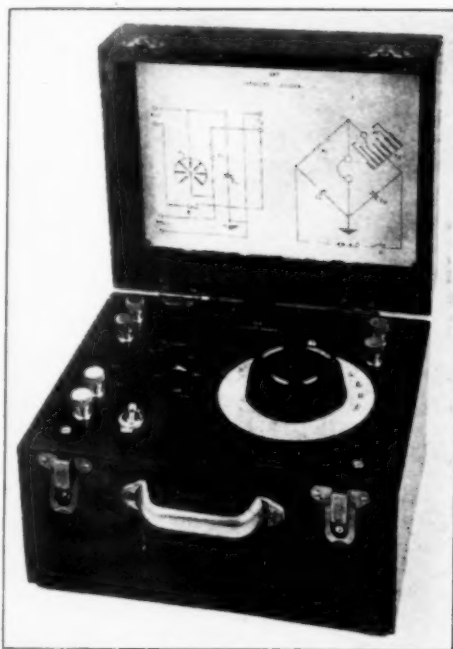
With a capacity bridge available, one can determine (at least to a close approximation) other important factors which should largely take the guess work out of amateur operation, design, and construction.

For instance, knowing the frequency at which a given circuit resonates, and then measuring its capacitance, it is a simple matter to determine quite accurately, the inductance of the circuit. This method can always be relied upon, for the product of inductance and capacity are directly related to the frequency of the circuit, and is especially valuable at high frequencies where mathematical calculations fail because it is impossible to account for stray or distributed inductance or capacitance. This relationship between inductance, capacitance and frequency makes it possible for the amateur to determine the number of turns to use on a given coil form for any frequency band if the capacity used is known.

Then, too, lots and lots of the condensers which are sold nowadays don't have anything like the actual capacity marked on the bakelite case. We recently came across one condenser which was marked as having a capacitance of 250 μfd . We found, upon measurement, that the actual capacity of the condenser was 425 μfd . — an error of 70%. One or two condensers of this sort in the tuned circuit of a transmitter would

certainly put the amateur out of the band if his calculations were made on the assumption that the condenser was a 250- μfd . unit.

But fixed condensers marked with their supposed capacity aren't the only condensers whose actual capacitance is not known. What



THE CAPACITY BRIDGE OPEN FOR USE

about that neutralizing condenser? Has it a capacity of 10 μfd . or 100 μfd .? What capacity is actually used in the circuit when the plates of a variable condenser are not entirely enmeshed? What size should be used to give full dial coverage of the amateur band, and how shall its capacitance be determined? Perhaps the wiring of the set is such that the circuit capacity is high; maybe high circuit capacity causes the tube to go into parasitic oscillation and behave erratically! A simple capacity bridge, such as described in this article, will help solve all these problems.

The accuracy and simplicity of bridge methods have made them almost universally accepted for the measurement of capacity, especially for values smaller than one microfarad. Although there are a number of bridge arrangements, all

* Former Assistant Technical Editor, QST.

of them depend for their operation upon the balancing of potentials in the bridge arms so that the current through the indicating device is zero for the condition of balance.

The bridge described in this article has a range from 10 $\mu\text{fd.}$ to 0.05 $\mu\text{fd.}$, and if carefully calibrated its accuracy will be well within 3%,

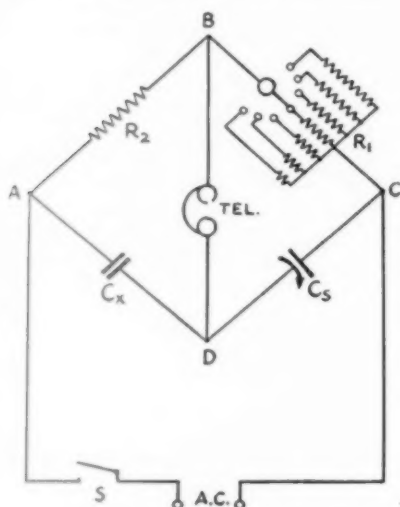


FIG. 1. — SCHEMATIC WIRING DIAGRAM OF THE BRIDGE

which is sufficiently accurate for amateur requirements. A schematic wiring diagram of the bridge is shown in Fig. 1, a layout diagram in Fig. 2, and the two photographs show the constructional details of the bridge. Accurate resistors, R_1 and R_2 , form two arms of the bridge. The third arm contains a calibrated variable air condenser, while the fourth arm is formed by the condenser whose capacitance it is desired to measure. All of the equipment used in the construction of the bridge is readily available to the amateur on the open market at reasonable prices.

The condition of balance in any bridge obtains when the arms of the bridge are adjusted so that the current through the indicating device (in this case a headset is used) is zero. That this condition be fulfilled the voltage drop across AB must equal the drop across AD , and similarly the drop BC must then equal that across DC . When the adjustments of balance are obtained,

$$\frac{C_x}{C_s} = \frac{R_1}{R_2}, \quad (1)$$

where: C_x is the capacitance of the unknown condenser,

C_s is the capacitance of the known or calibrated condenser,

R_1 is the resistance of the bridge arm BC , and

R_2 is the resistance of the bridge arm AB .

By multiplying both sides of the equation by C_s , Eq. (1) may be rewritten to give the capacity of C_x directly. The capacity of the unknown condenser is then given directly by:

$$C_x = C_s \left(\frac{R_1}{R_2} \right) \quad (2)$$

It will be seen from Eq. (2) that the capacitance of the unknown condenser, C_x , may be determined if we know (A) the ratio of the resistance R_1 to R_2 , and (B) the capacity of the standard condenser, C_s , at the setting which gives the null indicative of the point of balance.

The fact that the capacity of C_x depends upon the ratio of R_1/R_2 is a decided advantage in extending the useful range of the bridge, for by making this multiplying ratio less than unity we can measure condensers whose capacitance is less than that of C_s , whereas by making this ratio greater than unity, condensers whose capacitance is greater than that of C_s may be determined. The use of an adjustable ratio R_1/R_2 permits the single calibrated condenser to be used in making a variety of measurements of capacitance either smaller or larger than the capacity range of C_s . It will be seen from Eq. (2) that if the capacity of the standard condenser for a given bridge balance adjustment is 500 $\mu\text{fd.}$ and the ratio R_1/R_2 is 100, the capacitance of the unknown condenser will be 50,000 $\mu\text{fd.}$ or 0.05 $\mu\text{fd.}$ Similarly, if the condenser C_s were to be set at 500 $\mu\text{fd.}$ for the balance point and the multiplier switch set so as to select $R_1/R_2 = 0.1$, the capacity of C_x will be 50 $\mu\text{fd.}$ The limit of capacity measurements with this bridge is from approximately 10 $\mu\text{fd.}$ to about 0.05 $\mu\text{fd.}$, and the bridge is accurate to within 3% over this range.

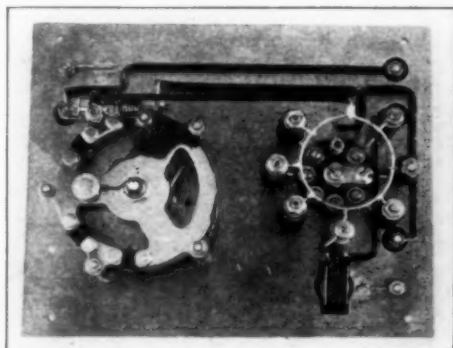
The construction of the bridge is not difficult — in fact it is much simpler than the construction of a single tube receiver. A list of parts used in the bridge is given at the end of this article. All of the parts should be obtained before the construction of any portion of the bridge is started.

The accuracy of the bridge will depend upon the accuracy of the components going to make up the bridge as well as upon the care with which the bridge is constructed and calibrated. Therefore, it pays to purchase well-made and accurate component parts and to take sufficient time in the construction of the bridge to make a good electrical and a substantial mechanical job of its construction. The standard condenser, C_s , should be a straight-line-capacity condenser (the kind with semi-circular plates) so that its capacity may be easily determined from its calibration chart. If a straight-line-wavelength, a straight-line-frequency, or some other hybrid condenser is used in the bridge it will not be so easy to obtain a balance and correctly interpolate readings because of the manner in which the capacity variation occurs. In general, a condenser having a maximum capacitance of 500 $\mu\text{fd.}$ is quite satisfactory; a condenser smaller than 250 $\mu\text{fd.}$

should not be used because of the lower ratio of maximum to minimum capacity of the smaller condensers.

The resistors for use in the bridge should be non-inductive, should have negligible capacitance, and should be accurate; the more accurate the better. The error in the resistance values of R_1 and R_2 affects the accuracy of the bridge, as may be seen from Eq. (2). The error introduced is approximately equal to the algebraic difference of the errors in R_1 and R_2 . If R_1 and R_2 are each accurate to within 1% of their specified resistance, errors of as much as 2% may be present. Similarly, if R_1 and R_2 are accurate to within $\frac{1}{4}$ of 1% the bridge cannot be depended upon for accuracy greater than $\frac{1}{2}$ of 1% of the correctly calibrated value. The type 6M resistors manufactured by the Shalcross Mfg. Co. used in this bridge, since they fulfill the conditions given above, are accurate to within 1%, and are reasonable in price. Moreover, being small in size, they may be easily and conveniently mounted, as may be

possible short circuits or grounds. No. 14 copper wire, covered with heavy spaghetti, is used in wiring the bridge, and since all wires are heavy



THE SIMPLICITY OF THE BRIDGE CONSTRUCTION IS APPARENT FROM THIS VIEW OF THE INTERIOR

The variable condenser is a Marco with a maximum capacity of 500 μfd .

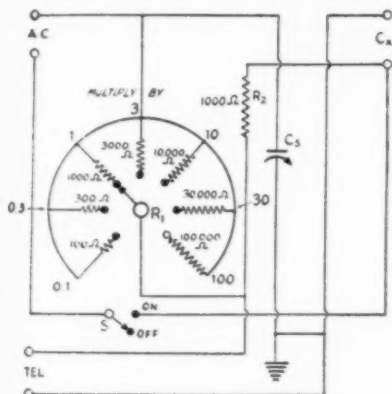


FIG. 2.—DIAGRAMMATICAL WIRING CIRCUIT OF BRIDGE

C_s is the standard 500- μfd . straight-line capacity condenser. The resistors used in the circuit are plainly marked.

seen from the cut showing the interior of the bridge.

The cuts show the layout and the method of mounting the apparatus. The bakelite panel upon which the apparatus is mounted is backed with heavy copper sheeting. Both the bakelite panel and the copper sheet are drilled at the same time so that all holes will coincide. The copper sheet is later cut away around the binding post, the a.c. switch, and the multiplier switch, to prevent short circuits; as shown in the photograph of the back of the bridge. The cabinet housing the bridge is also lined with copper.

When the panel has been properly drilled, finished, and engraved, the parts are mounted and wired according to the diagram of Fig. 2. The wiring is simple and the only precaution to observe is to provide sufficient clearance to avoid

and short, it is possible to make all connections rigid and solid.

When the bridge is properly wired the condenser C_s should be calibrated. Ordinarily this is a difficult task for the average amateur to accomplish, because variable condensers suitable for calibration purposes are seldom available. There are available to amateurs, however, methods of calibrating C_s sufficiently accurate for all amateur requirements.

The best procedure to follow in calibrating the bridge is to calibrate the condenser C_s against another condenser of known calibration. A source of a.c., preferably of 1000 cycles or of other pleasing high pitch (which may be obtained from a vacuum tube oscillator, tuning fork generator, or buzzer) is connected to the posts marked C_x and the switch S is closed. A hum will be heard in the phones which should be balanced out by adjusting the switch R_1 and by varying C_s until the hum disappears. In the event that it is impossible to obtain a well defined null point, the difficulty may usually be traced to excess pick-up from the generating apparatus. When the null point is obtained, the capacity of the condenser C_s will be equal to the capacity of the standard condenser divided by the multiplying factor of the switch. With this method of calibrating the bridge, a calibrated standard condenser is required.

A laboratory type standard condenser is desirable for this purpose but is not available to the majority of amateurs. However, the General Radio Co. case mounted type 247 condensers may be obtained with a dial calibrated directly in capacity, the error of this dial calibration being approximately 2%. This condenser

may be used as an inexpensive standard, or if used as C_s in the bridge, it will need no calibration other than that afforded by the dial supplied with it.

Another method of calibrating the bridge is to balance the bridge when fixed condensers of known capacity are connected across the posts marked C_x . As before, the capacity of C_s will be equal to the capacity of the fixed condensers divided by the multiplying factor of the switch,

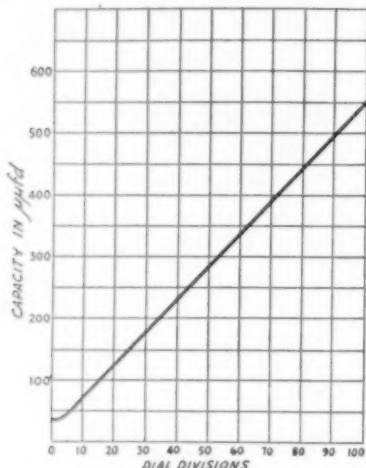


FIG. 3.—CALIBRATION CURVE OF THE STANDARD CONDENSER

This calibration is for C_s , or will apply to C_x if the rotary switch is set at 1. For the rotary switch set at any other value, C_x will be determined by reading the capacity of the standard condenser from the calibration chart and multiplying this by the multiplying factor of the ratio arms. Notice the curve at the low capacity end of the dial representing the minimum capacity of C_s . Needless to say, this calibration curve will not apply to your own meter.

but because the fixed condensers are seldom accurate to greater than 5% of their rated capacity, a number of fixed condensers of the same and of various capacities should be used to provide several good checks on the calibration of C_s . Enough checks should be made so that it will be possible to draw a smooth calibration curve through the points representing the capacity calibration of C_s .

In the event that none of these methods is available to the amateur, a graphical method of calibration may be resorted to if a straight-line capacity condenser is used and if the maximum capacitance of the condenser is quite accurately known. The minimum capacitance of 500- $\mu\mu\text{fd.}$ condenser is about 35 $\mu\mu\text{fd.}$ when mounted in a shielded case, whereas for the 350- $\mu\mu\text{fd.}$ and 250- $\mu\mu\text{fd.}$ condensers, the minimum capacitances are approximately 25 $\mu\mu\text{fd.}$ and 30 $\mu\mu\text{fd.}$, respectively. Assuming these values for the minimum capacitances of the condenser and knowing the maximum capacitance of the

condenser at 100, a straight line curve may be drawn through these two points for the calibration of the condenser. While this method of calibration is not entirely accurate, it will usually suffice for the measurements required in the average amateur station. Even though the absolute error with such calibration may be large, the bridge will still be useful for comparative purposes.

The list of parts used in this bridge is given below:

1 Wooden box with cover, 9½" x 7½" x 6½"	\$3.50
1 Bakelite panel, 9" x 7" x 3/16" . . . . .	.75
1 500- $\mu\mu\text{fd.}$ straight-line capacity variable condenser	5.00
1 Four-inch dial and marker	1.00
1 Seven-point inductance switch . . . . .	.50
1 100-ohm resistor	1.50
1 300-ohm resistor	1.50
2 1000-ohm resistors	3.00
1 3000-ohm resistor	1.50
1 10,000-ohm resistor	1.50
1 30,000-ohm resistor	1.50
1 100,000-ohm resistor	2.00
1 Closed circuit switch . . . . .	.50
6 Binding posts . . . . .	.60
Copper shielding	1.00
Engraving	1.75

Total \$27.10

A New Line of Power Transformers and Chokes

THE Acme Apparatus Corp., Cambridge, Mass., has just placed on the market a new series of transformers and filter chokes designed to take care of practically all amateur requirements. They are conveniently divided into two groups; for low-voltage tubes (suitable for receiving power-packs and transmitters which do not require more than 600 volts), and for transmitters of medium and high power.

In the low-voltage group of transformers, both plate and filament windings are included in the same unit. The largest transformer of this classification has a capacity of 250 V.A. The filter chokes to be used with these transformers are rated at 15 and 30 henrys, with current-carrying capacity ranging from 50 to 150 ma.

The transformers and chokes in the high-voltage group are all insulated for 7000 volts. Plate and filament transformers are separate units. The plate transformers are made in sizes ranging from 300 to 1000 V.A., and supply 1000, 1500 or 2000 volts each side of the center-tap. Filament transformers are designed to furnish the standard voltages for transmitting tubes and high-voltage rectifiers. The chokes are manufactured in four values of inductance, with current-carrying capacity ratings from 150 to 500 ma.

In addition to the above, The Acme Apparatus Corp. now manufactures an auto-transformer, 220-110 volts, in 250- and 500-V.A. sizes. Microphone transformers for both single and double-button microphones are also available.

QSY With Crystal Control

By Boyd Phelps, W2BP-W9BP*

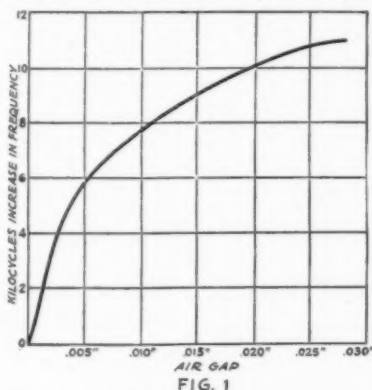
CRYSTAL control is generally accepted for commercial and broadcast transmitters where tolerance of only a few cycles deviation from one particular assigned frequency is permitted. For operation in a band, as in the case of the amateur, it has not such a strong argument but the advantages to be realized from stability are not to be overlooked and any good amateur station should take pride in always being found close to the same spot in the band for schedule operation, in not creeping out of tune of the distant receiver, and in not spreading over a hog's share of the band, not to mention being in the band — and a few other arguments.

But this rigid inflexible stability sometimes is a hardship and is one of the few reasonable arguments left against crystal control. I have fought through hours of QRM from two other stations on the same frequency as my crystal and being just as stubborn as they, stuck it out until daylight overtook us. (Eastern stations on 3500- kc. 'phone can be practically put out of business by low power 'phones a few hundred miles further west). When spasmodic semi-intelligent communication was established I was told that if I could shift a few kilocycles I would be free of QRM. I have tried grinding crystals for these mythical QRM-less holes, as others have done, with the conclusion that they are "subject to change without notice." The switching in of several crystals seems like a partial solution, though interference is often as bad on the new frequency, capacity losses in the switching arrangement reduce output, and the distant station cannot find you again in a different section of the band, especially since he probably did not get your telling him about where you were shifting to. These conditions can be remedied usually by a moderate shift in frequency, or at least remedied as much as general congestion in the band permits.

It is well known that several factors change crystal frequency. A variable condenser connected across the holder terminals will lower the frequency as this capacity is increased and it is a good method of obtaining final synchronism of two transmitters or final adjustment of a standard. However, when this capacity is a few microfarads the crystal stops oscillating and the range is only about a hundred cycles in a million, with reduced output as the capacity is increased. Temperature variation suggests another way of dodging interference if one wants to keep crushed

ice and a blow torch handy to manipulate the frequency as conditions demand. While water cooled crystals may have suggested themselves to some unfortunate amateurs, variation of frequency by juggling temperature is slow, sluggish and accompanied by the necessity of closely maintaining the finally chosen temperature as against changes due to heat radiation, convection and conduction.

To make a long story short, adjustment of the top plate above the crystal instead of resting on it represents one of the easiest ways of varying the



frequency. A surprisingly large frequency variation can be covered by regulating the air-gap above the crystal and still maintaining the characteristic crystal frequency stability over this range. As the pressure of the top plate on the crystal is reduced and some air gap introduced the power output actually increases, since decrement (mechanical loading) is reduced.

Reference to the curve of Fig. 1 shows a variation of frequency with air gap, with 11 kc. as the maximum. This curve was plotted from data obtained on a random picked ordinary 30-degree cut crystal in the 3500-kc. band using a Type '10 with 6 volts on the filament and 60 on the plate with a quarter megohm grid leak across the crystal in the ordinary conventional circuit. A micrometer opening up to two inches was fitted with a flat-faced plug over the movable side of the jaw and formed the top electrode. Frequency settings could be duplicated to about a hundred cycles without difficulty with this arrangement, which is about the change caused by a change in room temperature of one degree Centigrade. The power did not vary considerably over the lower portion of the curve that is practically a straight line but began to fall off when the frequency

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passed the 7-kc. deviation point and very rapidly between 10 and 11 kc. in this case. It is interesting to note that oscillation continued with an air gap even greater than the thickness of the crystal.

Let us examine for a moment what this possible shift may mean in reducing interference. In the first place it has little use on an amateur receiver having audio response much above 2,000 cycles and it usually is a disadvantage. (The A. T. & T. Co. transatlantic phone passes modulation only up to 2,500 cycles.) Peaked audio for code reception has been admirably covered in *QST* by Hatry, Hull, Bourne and others. Some amateurs

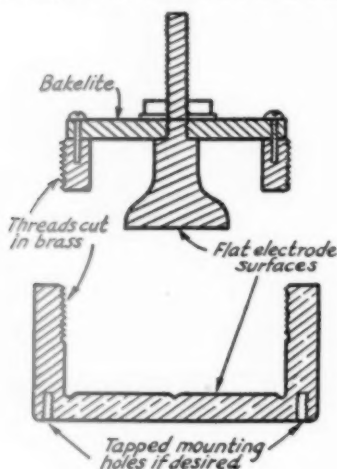


FIG. 2

in receiving do not make use of the fact that the relative beat note of two incoming signals can be transposed by working them on the other side of zero beat. For example, in getting nicely started copying a long message coming in on a beat note of 1500 cycles, an interfering station with a strong 500-cycle heterodyne busts the message. He may have heavy a.c. modulation or be too unsteady to hold at zero beat while the msg is copied on 1000 cycles, so the beat of the desired station is run through zero beat to the other side and up to a high enough pitch so that the interference (now a higher beat note than the desired signal) is relatively inaudible due to cut-off of the audio system. Some hams have been known to fight along with interference of about the same beat pitch but on the opposite side of zero beat. In such a case when the tuning vernier is moved, one note goes up and the other down and the stations separate themselves though in reality their transmitted frequencies are 3 kc. separated. From this discussion it may be seen that a frequency shift of 2 kc. ordinarily will be enough to permit copy even if the interfering station is exactly on top of the desired signals (the worst

condition) for this shift would permit reception at 1 to 2-kc. beat note with the interference at 3 to 4 kc.

From the curve it will be seen that operation with a little over .001" air gap will permit a 2-kc. variation of frequency in either direction by screwing the top electrode up or down. As mentioned previously and noted from the curve, this may be greatly extended to about 8-kc. variation with slight decrease in crystal output which may not necessarily reduce antenna input and even so is justifiable for improved communication. It is also to be noted that these frequency changes are with respect to the fundamental of a crystal in the 3500-kc. band. The effect is doubled in the 7000-kc. band and is four times as much in the 14,000-kc. band. In other words, a 44-kc. frequency shift is possible in the 14,000-kc. band and 20-kc. shift is entirely practicable.

After all the hashing up of the "Q" signals at the last International Convention and supposed modernizing of them, there is no adequate signal to request such a frequency shift. Our old ham-brew QSS signal got written into the new code in several places (QSB, QSC, QSF, etc.) and possibly if we suggest something to handle this situation it may find permanent use although probably with different letter designation. The following is easily remembered and leaves no doubt as to whether the frequency or wavelength is to be raised or lowered:

QIF: If possible please increase your frequency to avoid interference (or to get back in the band—hi).

QDF: Decrease frequency of your transmitter slightly.

NOTE.—The signal may be followed by a number designating the kc. shift requested. In the absence of this it is assumed to be approximately 2 kc. for telegraphy and 4 to 5 kc. if communicating by telephony.

THE HOLDER

The design of an adjustable air gap holder can take a number of forms according to the material and machine equipment at the disposal of the builder. The important and only difficult part of the job is to have the top plate mounted so it is parallel with the crystal or the bottom plate and will remain so as the air gap is varied. One should try and get it flat to .0001" and remain parallel to the same precision but for wide air gaps this is not so important. Of course the top plate must be insulated from the bottom plate and bakelite is far preferable to rubber or fibre.

If access is had to a machine shop the holder may follow Fig. 2 in which is shown a round brass cup with a hole $1\frac{1}{2}$ " in diameter, $\frac{3}{4}$ " deep, and with a $\frac{1}{4}$ " thick wall. The last two operations on the cup should be the cutting of the thread and light finishing cut on the bottom face against which the crystal is to lie. These two operations

(Continued on page 74)

Experiments With Dynatron Oscillators

By O. P. Susmeyan, W1BLH*

APPRECIABLE interest has been shown of late in vacuum tubes having negative-resistance characteristics. The primary purpose of this paper is to further stimulate this interest and to emphasize that these devices and their applications constitute extremely interesting material for study and experimentation. Illustrating one application, a heterodyne frequency meter using a negative resistance tube as an oscillator is described.

A number of years ago A. W. Hull produced a special form of three-electrode vacuum tube which made use of the phenomenon of secondary emission. This tube had a peculiar voltage current characteristic: For a certain range of plate potential, the plate current decreased with increased plate voltage. In other words, part of the E_p-I_p curve had a negative slope and the device acted as a negative resistance. Hull called his tube the "dynatron."

The "falling" characteristic of the dynatron is due to the emission by the plate of impact or secondary electrons and has been well explained in an earlier issue of QST by W. H. Newbold. It is on this part of the characteristic that the operation of the dynatron is based. The tube, when properly designed, can be used as detector, amplifier or oscillator. The latter case will be reviewed briefly here.

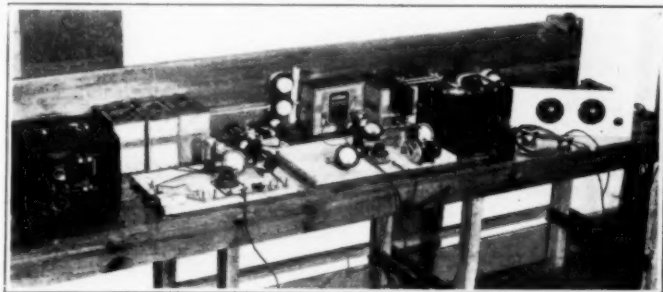
Fig. 1 shows a dynatron connected as an oscillator. Hull has made a mathematical analysis of the circuit and has shown that it can oscillate if $r < \frac{L}{RC}$ where L , C and R are, respectively, the tank circuit inductance, capacitance and resistance at the resonant frequency; and r is the positive numerical value of the dynatron negative resistance. The frequency of oscillation is, in most practical circuits, given to a close approximation

by $f = \frac{1}{2\pi\sqrt{LC}}$. It follows that the range of the frequency of oscillations is limited by the negative resistance of the tube and the L/RC ratio of the parallel circuit. This limit can be widened either by increasing the impedance of the tuned circuit or by decreasing the negative resistance

of the dynatron. By doing both, the writer has been able to generate frequencies of the order of 14,000 kc.

The impedance of the parallel circuit can be made a maximum by proper choice of the circuit constants and "low-loss" construction. Great progress has been made along this line during the past few years.

The negative resistance obtainable is, of course, limited by the particular tube used. Of the tubes available on the market today, the one possessing the best dynatron characteristic is the Type '24. Fig. 2 shows this characteristic for a few of the Type '24 tubes tested. The slope



THE EXPERIMENTAL LAYOUT

With this equipment measurements were made on the various tubes to determine their negative-resistance characteristics as well as the oscillator measurements described in the text. From left to right on the bench are the crystal temperature-control box, the breadboard layout for measuring static characteristics, the experimental oscillator, and a precision frequency meter.

(voltage divided by current) on the "falling" part of the curve represents the negative resistance of the tube. It will be seen that it varies

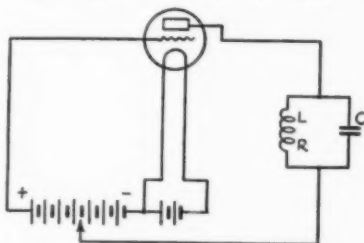


FIG. 1. — THE DYNATRON AS AN OSCILLATOR

A tube with a suitable falling characteristic must be used. With low negative resistance and proper choice of circuit constants a wide range of frequencies may be generated.

greatly from tube to tube, the variation being due to several small discrepancies which occur during the manufacture of the tube, affecting the spacing of the elements, cathode temperature, degree of

*Champion Radio Works, Inc., Danvers, Mass.

activity of cathode coating, condition of impact surface and degree of vacuum. These differences are negligible when the tube is used for the purpose for which it was designed, but they materially affect its negative resistance value as a dynatron and consequently vary the upper limit of frequencies obtainable with a given L/C



THE FREQUENCY METER

The coil and condenser are from a General Radio amateur frequency meter. The "B" batteries are inside the aluminum case, the "A" supply being furnished by an external battery. The filament voltage is held constant by adjustment of the rheostat.

ratio. Therefore, no set operating conditions can be specified. If maximum frequency is aimed at, the characteristic of each tube should be plotted and the most suitable operating point determined. Fig. 3 shows the simple setup used for obtaining the data. E_b can be varied by means of a suitable potentiometer. The negative resistance of the Type '24 at $E_f = 2.5$ v. and $E_d = 67$ v. was found to range anywhere from 6500 ohms to 16,000 ohms, the lower limit constituting the exception rather than the rule. With a tube of such low negative resistance it is possible to obtain frequencies of the order of 7000 kc.

The stability of the dynatron oscillator depends mainly upon the filament temperature. In the case of the Type '24 the filament voltage should be kept constant within two or three percent, the allowable variation being even smaller for the Type '22, which has a smaller filament. However, if the filament temperature is kept within reasonable limits, the stability of the dynatron oscillator is extremely good. From all tests made, it was concluded that this stability was fully as good as that of the non-temperature-controlled crystal.

If a pair of phones is connected in series with the plate of the dynatron, it will oscillate at a high audio frequency. This frequency may be lowered to three cycles per second simply by

increasing the inductance of the circuit and inserting capacitance in parallel with the phones. The stability of these audio frequencies also was found to be very good, especially when $\frac{L}{C}$ was made small.

By specially designing tubes for negative resistance operation, smaller resistances may be obtained. The writer has for some time devoted himself to the production of low negative-resistance dynatrons. Fig. 4 shows a comparison between a Type '24 having a fairly good negative slope and a low voltage dynatron. This particular dynatron is one of our first ones. It uses the same heater and cathode elements as the Type '24 and has a negative resistance of about 6200 ohms, a high value. Since then, dynatrons with much lower negative resistances have been produced, one of the larger types having a resistance of 1800 ohms. These dynatrons require from 125 to 150 volts on the grid and they pass a plate current of about 30 milliamperes. From the trend of the work now under progress, it is predicted that even lower resistances will be obtained. The filaments of these dynatrons are made to have a high temperature inertia to insure steady operation.

A DYNATRON FREQUENCY METER

In making a frequency meter for the use of WIBLH, the writer used a dynatron having a resistance of 2600 ohms with 70 volts on the grid. For the tuned circuit, the condenser and coils of a General Radio Type 558-P frequency meter

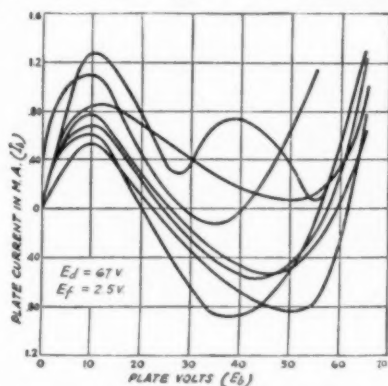


FIG. 2. — DYNATRON CHARACTERISTICS OF A GROUP OF TYPE '24 TUBES

Show the lack of uniformity in negative resistance, which accounts for the failure of some tubes to function as dynatron oscillators at very high frequencies.

were used. The experimental set-up is shown in a photograph. A temperature-controlled quartz crystal oscillator supplied the standard frequency and the frequency of the dynatron oscillator was made to beat against the crystal frequency and its harmonics. The beats between the

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two oscillators were picked up and reproduced by a conventional receiver. The resultant beat notes were found to be surprisingly steady.

Another photograph shows the finished meter enclosed in an aluminum casing, which also contains the "B" batteries. A shielded cable is

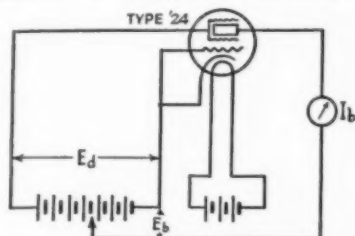


FIG. 3.—SET-UP FOR MEASURING NEGATIVE RESISTANCE OF A TYPE '24 TUBE

The heater voltage is held constant at 2.5 volts, and the screen-grid voltage at about 67 volts. The plate voltage may be varied by means of a potentiometer.

used for the "A" battery connections. A filament rheostat and voltmeter are essential. The National Type N vernier dial permits accurate readings.

The meter was calibrated from the crystal oscillator, while a precision meter was useful for frequencies intermediate to the quartz oscillator

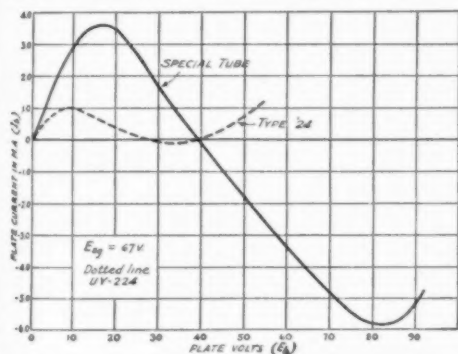


FIG. 4.—THESE CURVES SHOW HOW THE NEGATIVE RESISTANCE MAY BE DECREASED BY PROPER DESIGN OF THE TUBE

The solid curve was taken on a specially-designed dynatron, while the dotted curve represents an average Type '24 tube.

and its harmonics. This calibration could also have been obtained by listening to standard frequency transmissions, as has been explained in *QST* several times.

The dynatron frequency meter just described has been very satisfactory. Its upper frequency limit was found to be 10,700 kc. As mentioned before, frequencies above 14,000 kc. have been obtained but they necessitated the use of the larger dynatrons, with a tuned circuit consisting of the tube capacity and a few turns of heavy copper wire.

In conclusion, the experimenter and amateur is once more urged to look into the dynatron. For those interested, the following bibliography is given:

- W. H. Newbold, *QST*, Feb., 1930
A. W. Hull, *Proc. I. R. E.*, Vol. 6 (1918) No. 1.
A. W. Hull, E. F. Hennelly, F. R. Elder, *Proc. I. R. E.*, Vol. 10 (1922) No. 5.
A. L. Klein, *Phys. Rev.*, Vol. 26 (1925).
F. Horton and A. C. Davis, *Proc. Roy. Soc.*, p. 23-43 (1920).

Bringing Frequency Measurement Up to Date

(Continued from page 26)

dials will increase the accuracy which can be expected.

In the October issue of *QST* complete constructional information on a heterodyne frequency meter of the dynatron type will be given, together with information on how to calibrate the meter from standard frequency transmissions and how best to use it in the station.

Doings at Headquarters

(Continued from page 12)

Don Meserve, *QST*'s Advertising Manager, vacated his New York bailiwick and spent a couple weeks in Chicago on a business survey.

F. E. Handy is spending a vacation in Maine with his family.

K. B. Warner has left Hartford for the seashore, from where he is sandwiching in some vacation along with regular routine work.

J. J. Lamb, Tech. Ed., spent a few days in New York attending preliminary meetings relative to the C.C.I.R.

The rest of the gang here at Hartford have been taking a little snatch of vacation here and there, when duties permit.

W1MK and W1SZ have been on mornings lately keeping in touch with Australian stations. Fine relaying has been done by YS1X (a ship plying between New York and Chile), VK5HG and VK5GR, as well as a regular schedule being kept with VK2EK.

—C. C. R.

Pacific Division Convention Sacramento, California, October 17th and 18th

JUST a preliminary announcement of our forthcoming convention. See October issue *QST* for full particulars.

Harmonious Harmonics

By Uncle Jimmy and the Boys

BEAUTIFULLY strained music emerges from the peaked amplifier. The words are dreamily indistinct, yet reach our ears with piercing definition.

"Hi diddle dystal,

A Ham and a crystal.

The sig skipped over the land.

Commissioners laugh to hear such fun

(Provided we stay in the band)."

'You have been listening, dear little hams, to our theme-song as rendered by His Majesty, Old King Cole, and his harmony boys, The Fiddlers Three.

"His Majesty's services are made available through the courtesy of Santa Claus, Incorporated, manufacturers and distributors of transmitting tubes, crystals, and other ham supplies. Mr. Claus, president of the company, is, as you know, the patron saint of the little ham.

"Bitter opposition was presented by the Pied Piper, note specialist, when it was learned that the King was to broadcast from this station. It was argued by the Piper that the a.c. note emitted from His Majesty's pipe (produced by singing through it and allowing it to resonate in his bowl) had no place in modern transmission. The Piper's plea was quite eloquent, but the station management, convinced that Mr. Piper was allowing himself to be swayed by professional jealousy, set aside the objection.

"The new feature, though distressing, is certainly unique — which, of course, squares matters completely from the management's viewpoint. Personally, and just between hams, I am disappointed to learn that His Majesty's famous merri-ment is of the induced variety.

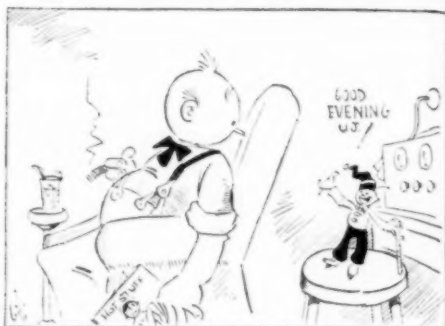
"You hear the boys for the first time tonight. If you find the sound of the King's pipe discordant, be thankful, at least, that you can't tune in its odor.

"Now, let me see . . . Oh yes, the fairy tale . . . First let me explain how it comes to pass that your old Uncle Jimmy is at the mike tonight.

"In order that he may remain a well-balanced ham instead of becoming a nut, Uncle Jimmy reads a certain amount of popular fiction. He has been complaining about the laziness of his favorite author, who has turned in few stories of late. It didn't occur to Uncle Jimmy that his own house might be not entirely shatter-proof. It didn't, in fact, occur to him that anyone gave a tinker's inspiration whether he wrote or not. Imagine, then, his consternation when he received a letter from a little ham who gently hinted that U. J. was growing lazy. The little ham didn't know that he

was writing to Uncle Jimmy; he thought he was writing to another little ham who has written a few things for QST.

"It was Uncle Jimmy, however, who received the letter and, believe me, he felt as mortified as if his call had appeared among the prehistoric sigs. There was but one grain of consolation in the in-



cident. The little ham's letter disclosed the fact that he is full of original ideas and that *he, himself*, should be writing for QST. He, in turn, can console himself with the fact that Hamdom is full of others just like him.

"That's that; now you understand that U. J. is at the mike to prove to you little hams that he's not lazy (which, of course, he is).

"Now I want to tell you about Piper. Piper dropped in one evening in his usual manner, sliding down the lead-in and skipping nimbly over the series condenser.

"'Good evening, U. J.,' he piped in his clear and tinkling tones. 'How is the push-pull perking?'

"'Who in Q-R-M-dom told you I was fooling with push-pull?' I asked, naturally startled at his knowledge of what I thought was a secret. Honestly, I believe I'll never get used to the way these fairies know everything.

"'Don't be silly,' said Piper as he yanked the dust-cover off of the new push-pull job. (The job, by the way, used the circuit of Fig. 1. If your scanning disc has the wrong number of holes, here it is in QST; Mr. Warner agreed to print the diagrams for this tale.)

"'I can't help appearing silly, P. P.,' I retorted, 'with you continually doing your best to make a fool of me. You know the answers to your questions before you ask 'em. You ask 'em just to show me up — just to tantalize me.'

"'Pooh, pooh, U. J.,' said Piper soothingly. 'I ask questions to stir up discussions —'

"To stir up argument, you mean."

"To stir up discussion and make you think. Thinking is very beneficial; you should foster it. Now, about this push-pull business; did you say you were using the second harmonic?"

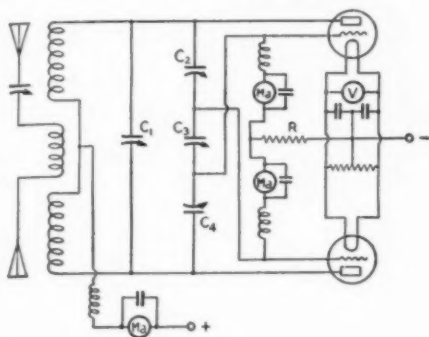


FIG. 1

Tubes are Type '10. C_1 is a two-gang condenser with the two halves paralleled — 750 micromikes. C_2 , C_3 and C_4 are 25-plate midgets. Grid meters, 0 to 25 mils; plate meter, 0 to 300. R can be 10,000 ohms or higher. Coupling may be varied by mounting the antenna coil on a rotor, or by hinging it so that it will swing in and out of the gap in the primary coil. Antenna coil may be wound (spaced a bit) with No. 12 or 14 antenna wire.

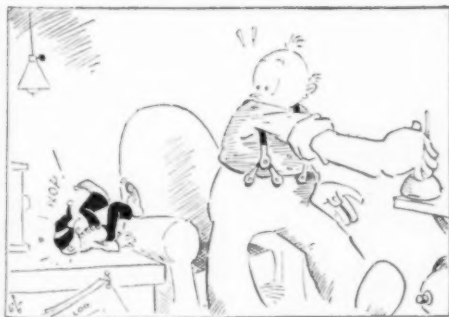
Adjustment is simpler than it looks. C_2 and C_3 are left at maximum capacity unless the grid of one tube receives more excitation than the other (as indicated by the grid meters). In this case, the capacity of one condenser (C_2 or C_3) is reduced till the meters balance. C_4 controls the amount of excitation to both tubes (the more capacity, the less excitation). Uncle Jimmy's thump filter will eliminate clicks — if you're good!

The only snag likely to be struck is the matter of grid chokes. They need to be good ones, designed for the band in which you work. Again, you need to be good.

The shunt condensers across the meters protect the meters from r.f.

"There isn't any second harmonic," I sulked. 'It cancels in push-pull.'

"There! What did I tell you? You're not thinking. It cancels in the main tank circuit, to be sure, but what about the plate choke?"



"You can't kid me, P. P.; it's the same thing there. The plate current from one tube is increasing while that of the other is decreasing and —"

"Piper fainted. I was frightened. What to do

for fainting fairies? Inspirationally, as it were, I recalled seeing King Cole, at the time of his first visit, experimentally and then enthusiastically sample the contents of the m.g. oil can on the shelf. Seizing the can, I forced a few drops of the liquid between Piper's lips. He revived instantly and sat up; then resumed the argument quite as if nothing had happened.

"You're much worse than I thought, U. J.," he said. 'See this.' He reached out and picked up the sheet of cross-lined paper that I was saving for the calibration curve of my new monitor. He rapidly drew the graph of Fig. 2.

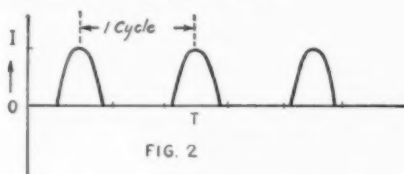


FIG. 2

"Here," he said, 'is a picture of the plate current as fed to the plate tank of a one-tube oscillator, plotted against time. Please note that the current flows during less than half of one cycle. If, now, we add another tube in push-pull, it will work in the same manner on the other half of the cycle. Your dull human intellect is a handicap, but you should be able to perceive that but one tube works at a time.' He drew Fig. 3.

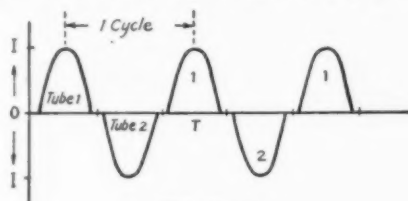


FIG. 3

"Hold on, Piper," I objected. 'You're drawing the curves for the second tube in the wrong direction.'

"Piper cast me a withering glance. 'The current from tube 2 flows through the helix in the opposite direction, therefore I have to draw the curves in that direction. An increase of current from one tube is equivalent to a decrease from the other.'

"Piper had me there, but I carefully extracted what I thought was the joker from my sleeve. 'Have it your way, P. P. Now, if you please, show me something in your figure that remotely resembles a second harmonic!'

"The little fellow set his lips grimly. 'I knew you'd forget what we were talking about. We've been discussing the main helix — where the harmonic cancels. Now we will consider the plate choke. Plate current flows through it in one direction only. If we look upon the plate choke as being the load circuit, we have something like

the equivalent of a circuit in which the input is push-pull and the output of the tubes is paralleled.

"I was beginning to see the light and I watched with enthusiasm while he drew Fig. 4. An idea

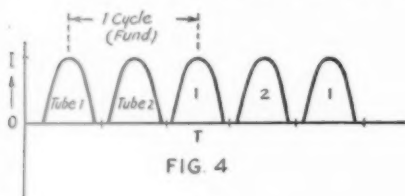


FIG. 4

popped into my head. 'I see it now, Piper. Splendid! Gee! all a fellow needs to do is to clip his antenna feeder onto a tuned choke and —'

"'Whoa! Not so fast, son.' (It always riles me when that type '99 wart calls me 'son.')

'You couldn't get enough second harmonic power into the antenna to make it worth your while.'

"'Why not?'

"'Because, for one thing, of the r.f. voltage-drop across the turns of helix between the choke and the tubes.'

"'I could use plate clips and move them in from the ends of the helix.'

"'Good move; even so, it wouldn't get you far. Most of the power dissipation would be in the tubes instead of the choke, where you need it. I'll try to explain.' He drew Fig. 5.

"I knew well enough that the little rascal had something up his sleeve, but I couldn't help bursting out: 'Piper, you can't get away with that; you can't compare resistance with a tuned reactance.'

"He grinned impishly. 'Don't kid yourself, son. A fairy can do whatever he likes. Now, tell me, which dissipates the greater number of watts, R_1 or R_2 ?'"

"He couldn't catch me there. ' R_1 ,' I said. 'The resistance of R_1 is greater, therefore the voltage-drop across it is greater; the current is the same in both resistors — but that's old stuff,' I broke off impatiently. 'The point is that you're trying to make an impossible comparison.'

"'Not at all,' he maintained. 'It's quite possible if you go about it properly. The tube itself, you will admit, is a variable resistor equipped with a fairy knob (the grid potential) which can be twirled back and forth at radio frequency. While in action, the tuned tank cannot be compared with pure resistance. We can, however, take instantaneous snapshots of the thing; get an idea of the voltage-drop across it at a given instant —'

"'I see!'

"'But you don't.'

"'Why can't you figure the instantaneous watts from the instantaneous volts and amperes?'

"Piper reeled and I reached for the m.g. oil. He recovered himself with an effort and waved me back. 'Never mind!' he said sharply. 'I'm all right, now . . . Instantaneous amperes! Watts! Shades of old audions! Surely, U. J., you understand that it takes time for current to flow? Amperes are coulombs per second. An instant is a dot in time; it has no dimensions. An instantaneous ampere is impossible.'

"'Then how in the name of crackling, double-forked QRN are you going to get anywhere with that crazy figure of yours?' I was really provoked.

"'By using an extended instant. By that means we can get a snapshot comparison that will serve nicely for all practical purposes. We will need to take a number of shots at various parts of the cycle to get an idea of the whole. On one side of the cycle we draw blanks as far as applied power is concerned; the grid potential is below cut-off — we are assuming, you understand, that r.f. voltage of the frequency to which the tank is tuned is being applied to the grid. The tank circuit is dissipating energy on both sides of the cycle because of its fly-wheel effect — pendulum

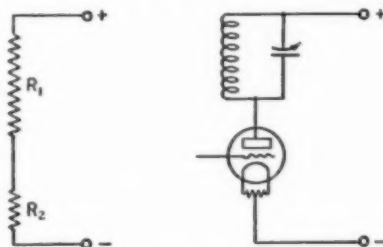
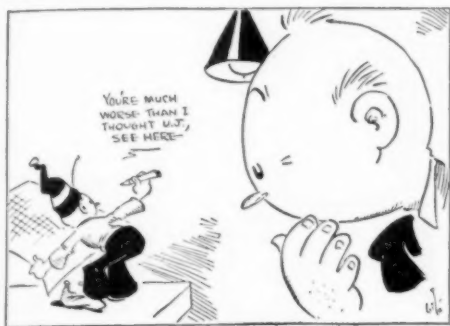


FIG. 5

effect. On one side, however, it is merely dissipating stored energy; we are interested only in noting how the applied voltage is divided between tube and tank at times when power is applied (when plate current is flowing).

"A few snapshots are revealing. We find that at the peak of the cycle the pendulum voltage is squarely opposed to the applied voltage. If the losses are low, the pendulum voltage is almost equal to the applied voltage. The difference between the two voltages is the voltage across the tube. Since this voltage is very low, the dissipation in the tube is slight compared to that in the tank — even though the grid is so positive as to allow a heavy flow of plate current. At other parts of the half-cycle, we find less reactance voltage (pendulum voltage), but the tube dissipation is still low because the grid isn't allowing much plate current to flow. (Power, you know, is produced by neither current nor voltage, but is the product of the two.) Our snapshooting brings out one fact very clearly. We notice that the grid never allows any current to flow while the pendulum voltage is aiding the applied voltage.

"It is hardly necessary to tell you the rest. The case of the fundamental input — second harmonic output is sad. The pendulum effect of the output tank causes it to complete nearly a full cycle while plate current is flowing. In other words, there are times when the pendulum volts are added to the power-supply volts and the sum applied to the tube while the grid is allowing



current to flow. The tube dissipation is enormous. High bias will improve the tank-tube dissipation ratio, but will also reduce the plate current so that the output will be low for the tube size and plate voltage used.' Piper sat back and sighed.

"Needless to say, I was disappointed. To have a vision of a transmitter which covered two bands by the simple expedient of shifting the antenna coupling from the plate tank to the plate choke and then to have that vision rudely snatched away — it was heart-breaking. I nearly wept. 'Piper,' I protested, 'why did you wake me up?'

"Piper is really a sympathetic little soul. Tiny tears glistened in his little eyes as he tried to console me. 'Don't grieve, U. J.,' he begged. 'There is at least enough second harmonic power available in the choke to handle the grid losses of an amplifier.'

"I became childishly unreasonable. 'Amplifiers are just a nuisance and, anyway, I have no battery for the bias!'

"Great Reaching Rettysnitch! They're in again. (See here, Your Majesty; these interruptions must cease. I'll have it understood —)."

(A door slams and we hear the sound of a new voice.)

"What's the row in here?"

"How do you do, sir? I take it that you are the new R. I.?"

"Are I? Whaddeya mean — 'are I'?"

"Pardon me! I thought, from the federal twang in your voice —"

"You got it right, mister; I'm federal all right. Who are these funny little face-cards? And what's in them bottles over there?"

"Permit me, sir, to present you to His Majesty, Old King Cole — who is really a merry old soul, in spite of his BCL penchant — and his —"

"You're crazy!"

"— Fiddlers Three. The pieces of apparatus which you call bottles are very expensive. They —"

"I bet you!"

"— are filled with r.f."

"So? Say, mister, I've heard it called by lots of names and I'm not so thick —"

"The evidence —"

We've no defence!

(Destroy it, King; be quick!)"

(The swish of His Majesty's pipe and bowl is distinctly audible as they hurtle through the air.)
Click! !

ELECTION NOTICE

To all A.R.R.L. Members residing in the
CENTRAL, HUDSON, NEW ENGLAND,
NORTHWESTERN, ROANOKE, ROCKY
MOUNTAIN and WEST GULF Divisions
of A.R.R.L.:

1. You are hereby notified that an election for an A.R.R.L. Director, for the term 1931-1932, is about to be held in each of the above Divisions, in accordance with the Constitution. Your attention is invited to Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Sec. 2 of Article IV, defining their eligibility; and By-Laws 10 to 19 providing for their nomination and election. Copy of the Constitution and By-Laws will be mailed any member upon request.

2. The election will take place during the month of November, 1930, on ballots which will be mailed from Headquarters in the first week of that month. The ballots for each Division will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in that Division.

3. Nominating petitions are hereby solicited. Ten or more A.R.R.L. members residing in any one Division have the privilege of nominating any member of the League in that Division as a candidate for Director therefrom. The following form for nomination is suggested:

(Place and date)

Executive Committee,
American Radio Relay League,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the Division, hereby nominate, of, as a candidate for Director from this Division for the 1931-1932 term.

(Signatures and addresses)

The signers must be League members in good

(Continued on page 82)

Standard Frequency System News

W9XAM to Start Operation—Special Transmissions Scheduled for Oceania and Far East

THE A.R.R.L. Standard Frequency System has made further advances since the last report and the second transmitting station is almost ready for service at the time of this writing. Regular scheduled transmissions from W9XAM are to begin in September, unless something unforeseen occurs to cause delay. Tentative schedules for W9XAM standard frequency transmissions are a part of this report. Last-minute information will be shot out in an official broadcast from WIMK. In case the authority for W9XAL to transmit these schedules does not come through on time, the call W9SI will be used for the first transmissions. However, it is quite probable that everything will be lined up by the time of the first September schedule.

The schedules have been arranged so that every Friday night will be a standard frequency night. It would be greatly appreciated if everyone but the S.F. stations would QRX during these transmissions and cut down the QRM which has been making them hard to get. Many of the gang have suggested this and it would certainly be worth trying. Incidentally, make use of the transmissions while you are standing by. That's what they are being transmitted for.

SPECIAL SCHEDULES FOR OCEANIA

Headquarters has received a request from the Wireless Institute of Australia, through the society's Hon. Secretary, asking that a 7000-kc. schedule be transmitted for Australian amateurs. This has been provided for by Schedule BX, to be transmitted by W9XAL at 4:00 a.m., C.S.T. (1000 G.C.T.) one Saturday each month. It is probable that an additional early morning schedule will be provided by the Pacific Coast station when it gets going in October. Harold Peery informs us that the frequency standard has been ordered for the Pacific Coast station and that the other equipment is being assembled. The call for this station has not been assigned at this time. We hope to publish its schedules in the October issue of QST, however. Next month should see the whole System in working order.

INTERPRETING THE SCHEDULES

The understanding of the Standard Frequency Schedules is quite simple and follows a few easy rules. The table of dates indicates the date of the month and day of the week on which the transmissions are to take place. The letters designating the schedules are combinations of the letters "A," "B" and "C." The presence of the letter

"A" indicates that the transmission is on the 3500-kc. band; "B" that the transmission is on the 7000-kc. band; and "C" that the transmission is on the 14,000-kc. band. The addition of a second letter to one of these designations indicates that the transmission is at a time other than the usual for that particular frequency. For instance, "BB" indicates a special afternoon transmission on 7000-kc. for European amateurs; "BX" indicates a special early-morning transmission for Oceania and the Far East. Schedules "A" and "B" always begin at 8:00 p.m., local standard time at the transmitter; those designated by the letter "C" always begin at 4:00 p.m., local standard time at the transmitter.

DATES OF TRANSMISSION

Date	Schedule	Station
Sept. 12, Friday	A	W1XP (W1ANV)
	B	W9XAM (W9SI)
Sept. 19, Friday	BB	W1XP
	B	W9XAM
Sept. 21, Sunday	C	W9XAM
Sept. 26, Friday	B	W1XP
	A	W9XAM
Sept. 27, Saturday	BX	W9XAM
Sept. 28, Sunday	C	W1XP
	BB	W9XAM
Oct. 3, Friday	A	W1XP
	B	W9XAM
Oct. 10, Friday	BB	W1XP
	B	W9XAM
Oct. 12, Sunday	C	W9XAM
Oct. 17, Friday	B	W1XP
	A	W9XAM
Oct. 18, Saturday	BX	W9XAM
Oct. 19, Sunday	C	W1XP
	BB	W9XAM
Oct. 24, Friday	A	W1XP
	B	W9XAM
Oct. 31, Friday	BB	W1XP
	B	W9XAM

STANDARD FREQUENCY SCHEDULES

Friday Evenings Schedule and Frequency			Friday and Sunday Afternoons Schedule and Frequency		
Time (p.m.)	A	B	Time (p.m.)	BB	C
	kc.	kc.		kc.	kc.
8:00	3500	7000	4:00	7000	14,000
8:08	3550	7100	4:08	7100	14,100
8:16	3600	7200	4:16	7200	14,200
8:24	3700	7300	4:24	7300	14,300
8:32	3800		4:32		14,400
8:40	3900				
8:48	4000				

Saturday Morning Schedule and Frequency

Time (a.m.)	BX
	kc.
4:00	7000
4:08	7100
4:16	7200
4:24	7300

The time is *local standard time at the transmitting station*. W1XP-W1AXV uses Eastern Standard Time and W9XAM-W9SI uses Central Standard Time. For conversion from E.S.T. to G.C.T., 4:00 p.m. E.S.T. is 2100 and 8:00 p.m. E.S.T. is 0100, G.C.T. For conversion from C.S.T. to G.C.T., 4:00 p.m. C.S.T. is 2200, 8:00 p.m. C.S.T. is 0200, and 4:00 a.m. C.S.T. is 1000 G.C.T.

The special Friday afternoon 7-mc. schedule transmitted by W1XP-W1AXV is intended particularly for European listeners, although it is useful in Eastern North America also. The special Saturday morning 7-mc. schedule from W9XAM-W9SI is transmitted at the request of the Wireless Institute of Australia. Amateurs in all parts of the world are requested to listen for and report on this transmission. It should be useful not only in Oceania and the Far East but also throughout the Americas.

Although frequencies of the transmitting stations are not guaranteed as to accuracy, every effort is made to keep to within 0.01% of the announced frequencies. The station standards are calibrated from the National Frequency Standard at the Bureau of Standards, Washington, D. C. Frequent checks on the transmissions are made by laboratories equipped with accurate frequency standards. The transmissions are also checked by the U. S. Department of Commerce monitoring stations. A recent check made by the Department of Commerce Monitoring Station at Hingham, Mass., showed that a 7000-kc. schedule transmitted by W1AXV was accurate to within less than 50 cycles. This accuracy is within one thousandth of 1% and over ten times as good as the specified accuracy of the transmission, which is 0.01%.

TRANSMITTING PROCEDURE

The time allotted to each transmission is now 8 minutes, divided as follows:

- 2 minutes — QST QST QST de (station call letters).
- 3 minutes — Characteristic letter of station, interrupted by call letters. Characteristic letter of W1XP-W1AXV is "G." Characteristic letter of W9XAM-W9SI is "D."
- 1 minute — Statement of frequency in kilocycles, to nearest integral figure, and announcement of next frequency.
- 2 minutes — Time allowed to change to next frequency.

W1XP-W1AXV: Communications Department Experiment Station, Massachusetts Institute of Technology, Round Hill, South Dartmouth, Mass. Howard A. Chinn in charge.

W9XAM-W9SI: Elgin Observatory, Elgin National Watch Co., Elgin, Ill. Frank D. Urie in charge.

During the hour preceding each standard frequency schedule, W1AXV offers the individual

QRG service described in the May and July issues of QST. Listen for W1AXV during these periods as well as during the regular S.F. transmissions.

Finally, do not forget to QSL the transmissions. All reports should be sent to the A.R.R.L. Standard Frequency System, 1711 Park St., Hartford, Conn. A record will be made at Headquarters and the report will be then forwarded to the proper station. S.F. blanks can be obtained from Headquarters, free and postpaid, upon request.

— J. J. L.

Roanoke Division Convention At Richmond, Virginia, September 19th and 20th

RICHMOND! Richmond! On to Richmond! The Virginia Section of the Roanoke Division, under the auspices of the Richmond Short Wave Club, will hold their first convention at the Hotel Richmond, Friday and Saturday, September 19th and 20th, respectively, and extend to all amateurs and A.R.R.L. members a cordial invitation to this affair. Worthwhile speakers will be present to talk on interesting subjects, amongst whom are Dr. Woodruff, Director of the Atlantic Division; our own Director, Mr. Gravely; our S.C.M., J. F. Wohlford; Mr. William Reveley of the A. T. & T., and we are hopeful of having Dr. C. Francis Jenkins, the father of television.

So you see, gang, our program from a "talk-fest" standpoint will leave nothing to be desired. A.R.R.L. Headquarters are sending A. A. Herbert, the Treasurer and Fieldman, as the official representative.

There will be plenty of sightseeing, entertainment, a regular "Ham Booth" at the Radio Show, with short-wave equipment on display, and last, but not least, the biggest Banquet on Saturday evening with distributions of trophies. The cost for the two-day convention is \$4.00.

Of importance — please write R. N. Eubanks, Chairman, 2817 Montrose Ave., Richmond, Va., and signify your intentions.

Strays

Hams should encourage their motorist friends to install broadcast receivers in their cars. The ignition interference suppressors stop one source of noise on the higher frequencies. If we could only induce some of these truck and bus operators to do likewise!

Hum in an a.c. receiver can sometimes be reduced by simply reversing the connections to the 110-volt line.

The Operating Characteristics of Vacuum Tube Detectors

A Graphical Study of Grid and Plate Detection for Triode and Screen-Grid Tubes

In Two Parts—Part II

By H. A. Robinson, W3LW*

LET us now consider the screen-grid tube in the rôle of detector. For plate detection, the Type '24 is connected as shown in the schematic diagram of Fig. 17A.

The series of curves of Fig. 18 show the variation of detector gain with r.f. input for several

over a triode, both employing plate detection, is evident. The effect of shifting the operating point by changing the grid bias is quite pronounced for detector performance at various input signal voltages, as shown by the curves of Fig. 20 as well as those of Figs. 18 and 19. The higher signal voltage levels require an increasingly greater

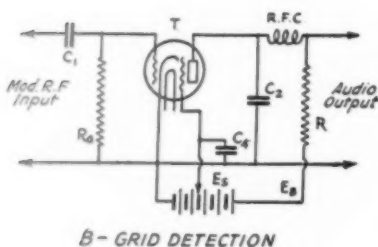
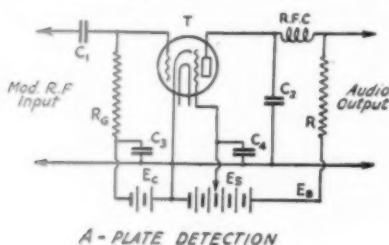
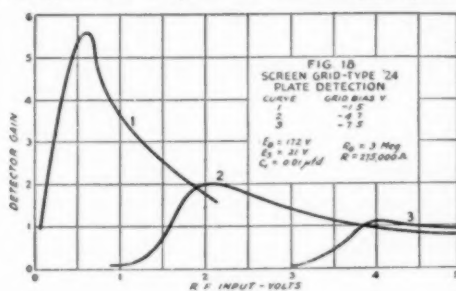


FIG. 17

- C_1 — Grid Condenser.
- R_g — Grid Leak.
- R — Plate Load Resistance.
- C_2 — 100 μfd .
- C_3 — 1 μfd .
- C_4 — 0.1 μfd .
- R.F.C. — Radio Frequency Choke.
- T — Type '24 Tube.

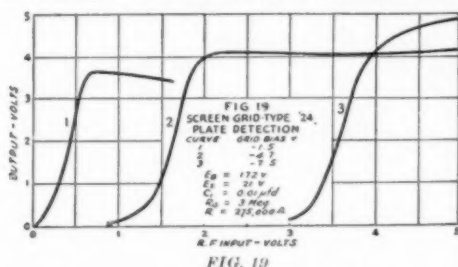
values of negative control grid bias, while the corresponding series of curves of Fig. 19 show the audio output voltage variation under the same condition. Here again the detector gain reaches a decided maximum and the increased gain obtained by the use of a screen-grid detector

* Silver Lake Farm, Willow Grove, Pa.



negative control grid bias for maximum detector output.

Figs. 21, 22 and 23 show similar variation of detector gain and audio output voltage respec-



tively for several values of screen-grid voltage, the optimum condition for detector performance depending largely upon the input signal voltage. The operating voltages for the curves of Fig. 23 indicate the necessity for relatively low screen grid and control grid voltages for maximum detector performance at the low signal input (less than 0.5 volts).

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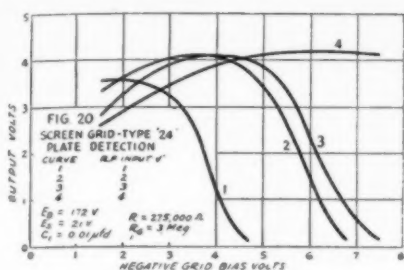


FIG. 20

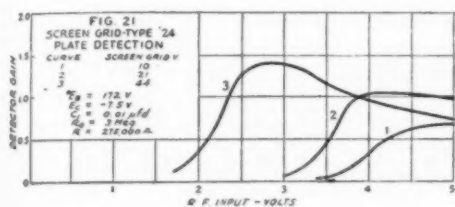


FIG. 21

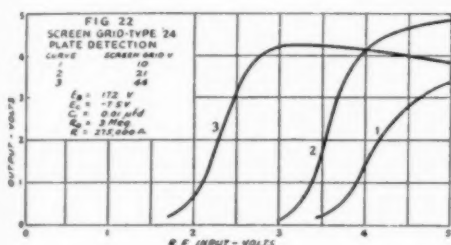


FIG. 22

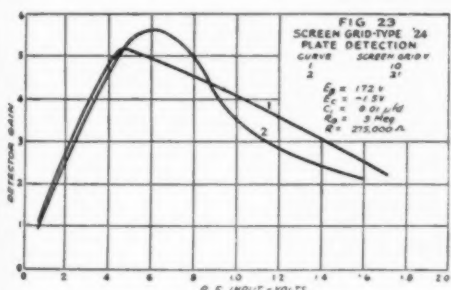


FIG. 23

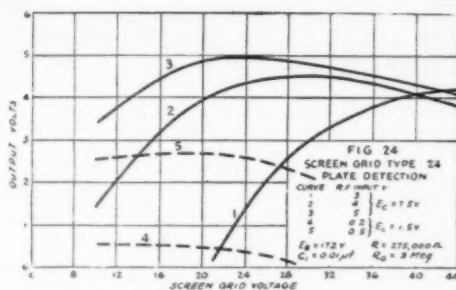


FIG. 24

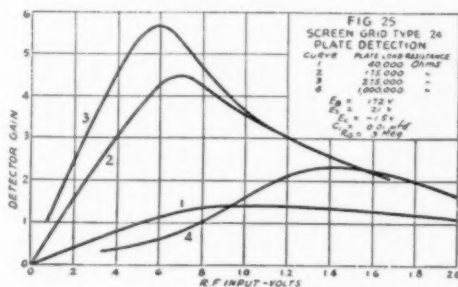


FIG. 25

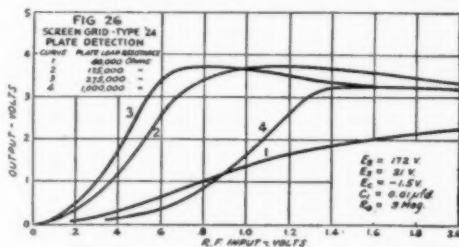


FIG. 26

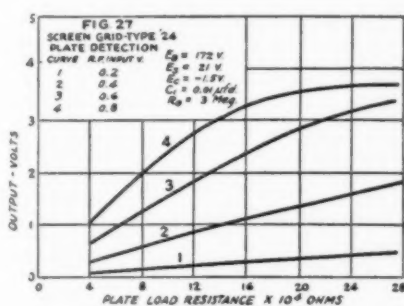


FIG. 27

This same conclusion is reached by analysis of the series of curves of Fig. 24. Here the variation in output voltage with screen-grid voltage is shown for several values of r.f. signal input as well as two values of control grid bias. These curves (4 and 5) indicate that the screen-grid voltage is not particularly critical for plate detection at low signal voltages.

The effect of the external load impedance in the detector plate circuit upon the detection is shown

by the series of curves of Figs. 25 and 26. These curves would indicate that the optimum value of plate load resistance is of the order of 250,000 ohms for the screen-grid and control-grid voltages employed in these measurements. These operating voltages play an important part in determin-

ing the best value of load for detector performance over a considerable range of signal input voltages. However, this value of plate load is not critical. This is particularly true for detection at the lower signal inputs as shown by the curves of Fig. 27.

THE SCREEN-GRID TUBE AS A GRID DETECTOR

The consideration of the performance of the screen-grid tube as a grid detector will perhaps

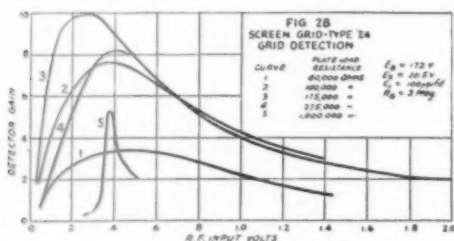


FIG. 28

be of greatest interest, to the average amateur, than all the arrangements considered thus far. The schematic diagram of Fig. 17B shows the circuit arrangement.

The series of curves of Fig. 28 show the variation of detector gain with r.f. signal input for

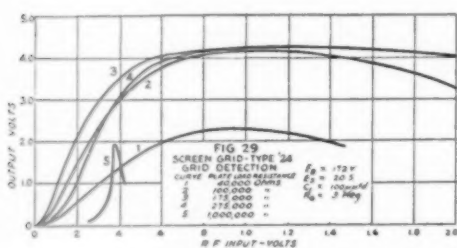


FIG. 29

several values of plate load resistance and the curves of Fig. 29 show the corresponding variation of detector audio output voltage. The variation of detector gain follows the same general

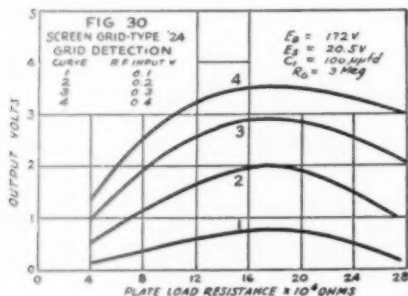


FIG. 30

form of performance as obtained with plate detection, but the greatly increased value of detector gain at low signal voltages is quite apparent. For the particular operating voltages used in these measurements a plate load resistance of the order of 175,000 ohms seems to be most favorable. This value varies considerably with the plate and screen-grid voltages employed.

The curves of Fig. 30 show the variation of detector audio output with plate load resistance for several different signal input levels. These

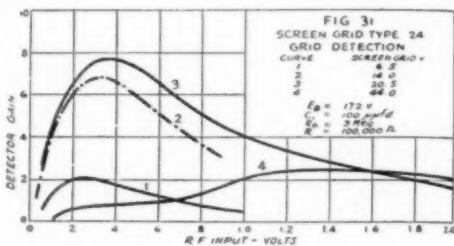


FIG. 31

curves tend to indicate that the value of plate load resistance is far from critical.

The effect of screen-grid potential upon the performance of this type of detector is clearly shown by the series of curves of Figs. 31, 32 and 33. The variation of detector gain with r.f. input is shown for several values of screen grid potential by the curves of Fig. 31 and the corresponding variation of output voltage is shown by Fig. 32.

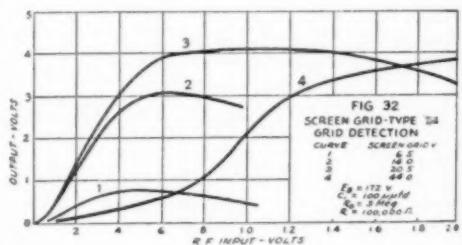


FIG. 32

The best value of screen-grid voltage seems to be of the order of 21 volts for these particular operating conditions. This value does not appear to be critical, however, as the curves of Fig. 33 indicate. This series of curves shows the variation of detector output voltage with screen grid potential for several signal input voltage levels. The value of screen grid potential for maximum detector performance will depend considerably upon the plate voltage and plate load resistance as well as upon the input signal level at which detection is to take place.

SUMMARY

The performance of typical triode and screen-grid tubes has been considered for various operat-

ing voltages, circuit constants and signal input levels, and the numerous factors influencing the detector operating characteristics have been studied and their effects shown in a more or less complete series of detector performance curves.

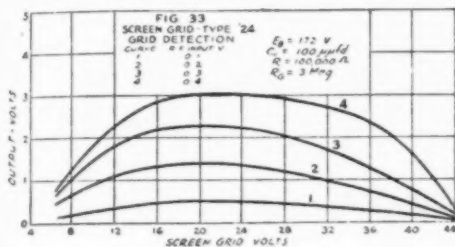


FIG. 33

This experimental data should be of value in determining the proper type of vacuum tube detector and its operating characteristics for most of the usual applications.

The curves of Fig. 34 are plotted on logarithmic scales and show the relation between detector

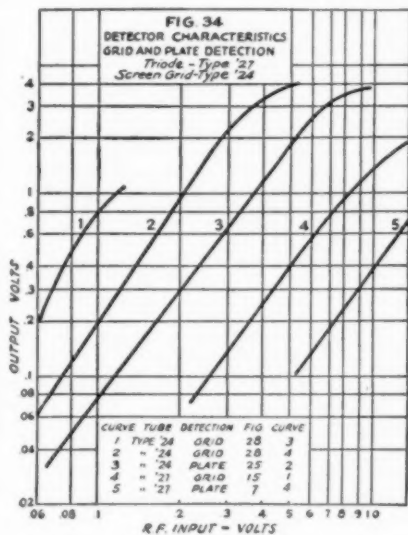


FIG. 34

audio output voltage and r.f. signal input for the various types of detectors. It will be noticed that this comparison is made at relatively low signal input levels. The order of performance of the various types of detectors will be different at higher signal levels.

The slope of these curves gives the power by which the detector output varies with the r.f. input voltage. This slope is of the order of 1.5 and no account of distortion of the output has been taken. The operating voltages and circuit constants for each of these performance curves can be

determined readily by reference to the figure and curve numbers corresponding to the data considered.

A more complete summary and comparison of the operating characteristics of the detectors considered is given in Table 1. The maximum detector gain for the Type '27 and Type '24 tubes as both grid and plate detectors was obtained from the performance curves previously analyzed, and these values of detector gain are compared graphically in the table. The actual operating voltages and circuit constants for each value can be obtained by reference to the curve indicated in the column under that heading, giving the figure and curve numbers.

This comparison of detector performance was made at four different values of r.f. signal input. The relative merits of the several detector ar-

TABLE 1 SUMMARY OF DETECTOR CHARACTERISTICS					
TUBE	DETECTOR	OUTPUT V	CURVE	DET GAIN	RELATIVE DET GAIN
R F INPUT = 0.1 V					
TYPE 27	GRID	0.15	12-3	1.5	100
TYPE 27	PLATE	~	~	~	1
TYPE 24	GRID	0.8	28-3	8.0	100
TYPE 24	PLATE	0.15	18-1	1.5	100
R F INPUT = 0.5 V					
TYPE 27	GRID	0.75	13-2	1.5	100
TYPE 27	PLATE	0.09	7-4	0.2	1
TYPE 24	GRID	3.9	28-3	7.8	100
TYPE 24	PLATE	2.75	18-1	5.5	100
R F INPUT = 1 V					
TYPE 27	GRID	1.57	10-4	1.6	100
TYPE 27	PLATE	0.37	7-4	0.4	1
TYPE 24	GRID	4.2	28-3	4.2	100
TYPE 24	PLATE	3.7	25-2	3.7	100
R F INPUT = 5 V					
TYPE 27	GRID	3.7	10-4	0.74	1
TYPE 27	PLATE	3.34	7-3	0.67	1
TYPE 24	GRID	~	~	~	~
TYPE 24	PLATE	4.85	18-3	0.97	100

TABLE 1

rangements are dependent to a great extent on the value of signal input at which detection takes place. The results of these arrangements would lead to the following conclusions:

1. At signal inputs of the order of 0.1 volt or less the screen-grid tube as a grid detector is by far the most sensitive of the arrangements measured, the triode as a plate detector being the least sensitive.

2. These same conclusions hold for signal input levels up to 0.5 volt, though the screen-grid tube as a plate detector shows considerable gain at this value of signal voltage.

3. At higher signal levels (of the order of 5 volts) both types of tubes as plate detectors show

the best performance, with the screen-grid type giving maximum gain. The Type '24 as a grid detector at these signal levels is least effective. It should be noted that the screen-grid tube is operating with a high plate load impedance under these conditions and must be worked directly into the grid circuit of the following audio amplifier tube. In the case of the triode, however, for both grid and plate detection the output was across the primary of an audio transformer. With the triode there can be an added gain due to the step-up ratio of a suitable coupling transformer and this must be considered in a rigid comparison of the two types of tubes as detectors.

Again, it should be remembered that all the measurements were made on a 1500-kc. carrier modulated 30 per cent by a 400-cycle audio frequency, unless otherwise specified.

In conclusion, it is hoped that this paper may prove of benefit to the amateur fraternity by promoting a better understanding of the operating characteristics of vacuum-tube detectors and the factors influencing the detector performance, as well as by giving experimental and comparative data on typical vacuum-tube detectors.

APPENDIX

The non-linear relation between current and voltage, such as that shown by the dynamic characteristic of Fig. 1, can be expressed mathematically:

$$i = f(e')$$

where i = current

e' = electrode voltages

f = some function

Expanding this relation in the form of a series:

$$i = a_0 E_0 + a_1 e + a_2 e^2 + \dots \quad (1)$$

where E_0 = steady d.c. operating voltages

e = impressed signal voltage

a_0, a_1, a_2, \dots = constants depending on the operating voltages, plate resistance, curvature of characteristic, etc.

Considering the case of an impressed signal consisting of a plain unmodulated radio-frequency carrier, then

$$e = E \sin \omega t$$

where $\omega = 2\pi f_r$

and f_r = carrier frequency

Substituting this in (1) to obtain the corresponding current variation:

$$i = a_0 E_0 + a_1 E \sin \omega t + a_2 E^2 \sin^2 \omega t + \dots$$

Expanding these terms into components of fundamental or harmonic frequencies:

$$i = a_0 E_0 + a_1 E \sin \omega t + \frac{a_2 E^2}{2} (1 - \cos 2\omega t) + \dots$$

The first term is the steady direct current determined by the operating voltages, E_0 :

$$a_0 E_0 = I_0$$

The second term is the current component of fundamental radio frequency:

$$a_1 E \sin \omega t = I_1 \sin \omega t$$

The third term has two components. One is of double the frequency of the impressed signal:

$$-\frac{a_2 E^2}{2} \cos 2\omega t = I_2 \sin (2\omega t + \phi)$$

The second component is an added d.c. increment:

$$\frac{a_2 E^2}{2} = \Delta I$$

Thus it is seen that the d.c. increment due to the impressed signal comes out of the squared term of the series and is proportional to the square of the radio frequency signal amplitude (E). This is the term which determines the detector performance, neglecting higher powers of the series. This is permissible, without introducing appreciable error, for detection at small signal levels.

For the case of detection of a c.w. signal by the heterodyne method, two radio-frequency signals of slightly different frequency are impressed on the grid. In the autodyne system, one frequency is the incoming frequency (f_r) and the other is the locally generated oscillation frequency (f_l). These can be represented by

$$E_1 \sin \omega t, \text{ where } \omega = 2\pi f_r$$

$$\text{and } E_2 \sin qt, \text{ where } q = 2\pi f_l$$

$$\text{Therefore, } e = E_1 \sin \omega t + E_2 \sin qt$$

Substituting this in (1) and expanding as before, we obtain the relation for current:

$$i = a_0 E_0 + a_1 (E_1 \sin \omega t + E_2 \sin qt) + a_2 (E_1^2 \sin^2 \omega t + E_2^2 \sin^2 qt + 2E_1 E_2 \sin \omega t \sin qt) + \dots$$

Expanding and reducing to components of fundamental or harmonic frequencies:

$$i = a_0 E_0 + a_1 E_1 \sin \omega t + a_1 E_2 \sin qt + \frac{a_2 E_1^2}{2} + \frac{a_2 E_2^2}{2} - \frac{a_2 E_1^2}{2} \cos 2\omega t - \frac{a_2 E_2^2}{2} \cos 2qt + a_2 E_1 E_2 \cos (\omega + q)t + a_2 E_1 E_2 \cos (\omega - q)t$$

Examining these current components, we find first the steady d.c. due to the operating voltages:

$$a_0 E_0 = I_0$$

The second term is of the frequency of the impressed r.f. signal and the third term is of the same frequency as the locally generated carrier, also of radio frequency.

The fourth and fifth terms are the d.c. increments due to the impressed signals while the sixth and seventh are second harmonics of the incoming and locally generated r.f. signals. The eighth term is also a radio frequency component and is of a frequency equal to the sum of the local and carrier frequencies. None of these components produces an audible signal. The last term, however, is the useful term. It represents the audible beat frequency between the incoming r.f. signal and the local oscillator frequencies.

It will be noted that this useful component comes from the squared term of the original series and that the coefficient (a_2) enters both this term and the d.c. increments, thus justifying the relation between the d.c. increment and the detector performance.

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Experimenters' Section

A Method of Measuring Capacity and Inductance

By C. A. Briggs, W3CAB *

THE calibration method to be described may be useful to experimenters who desire a variable condenser for measuring capacities or inductances and who have no regular laboratory apparatus for the work. The equipment consists of the variable condenser to be calibrated, a fixed condenser of known value (but with less capacity than the maximum of the variable condenser) and a coil of such inductance that in connection with the variable condenser the broadcast frequencies will be covered.

The variable condenser should be connected to the coil, which should be solidly constructed, and the fixed condenser so arranged that it can be connected in parallel with the variable condenser or taken out of the circuit at will. This, in effect, forms a frequency meter for the broadcast band.

In the experimental observations, the curve of frequency in kilocycles versus the reading of the condenser dial is first determined, the fixed condenser being left out of the circuit. This course is readily obtained by using a suitable radio receiver to tune in and identify broadcasting stations whose frequencies are known, and the receiver is also used to determine when the frequency meter is brought in tune with them. An unshielded receiver will be best for this purpose.

After the frequency meter is calibrated and the curve carefully plotted, a station in the lower frequency range of the broadcast band is tuned in and the fixed condenser connected in the circuit. The variable condenser is then backed off until it is again tuned to the selected station and the reading noted.

The known quantities involved then comprise the frequency of the station chosen, the value of the fixed condenser, the reading of the dial, and, from the frequency calibration curve, the frequency corresponding to the dial reading when the fixed condenser is not in place. From these quantities can be determined the inductance of the coil and the capacity of the condenser corresponding to various readings of the dial.

The relations involved are as follows:

$$LC = \frac{1}{4\pi^2 f^2} \dots \dots \dots (1)$$

where L = inductance in henrys, C = capacity of condenser in farads, and f the frequency in cycles per second.

When the small condenser of known value is placed in the circuit and the frequency meter is tuned to a chosen frequency, the relation can be expressed

$$L(C+K) = \frac{1}{4\pi^2 f_1^2} \dots \dots \dots (2)$$

where K is the value of the fixed condenser and f_1 is the particular frequency selected.

Denoting by f_2 the frequency corresponding to the same reading when the fixed condenser is removed, as shown by the calibration curve, we can write

$$LC = \frac{1}{4\pi^2 f_2^2} \dots \dots \dots (3)$$

By eliminating C between equations (2) and (3) we obtain

$$L = \frac{1}{4\pi^2 K} \left(\frac{1}{f_1^2} - \frac{1}{f_2^2} \right) \dots \dots \dots (4)$$

The value of L may be computed by inserting the proper values for K , f_1 and f_2 as obtained in the experimental work.

Substituting the value of L as given in equation (4) in equation (1) and rearranging terms there results

$$C = \frac{1}{f_2^2} \left(\frac{K f_1^2 f_2^2}{f_2^2 - f_1^2} \right) \dots \dots \dots (5)$$

The quantity $\frac{K f_1^2 f_2^2}{f_2^2 - f_1^2}$ is a constant for the particular coil used and its numerical value can be computed from the known quantities K , f_1 and

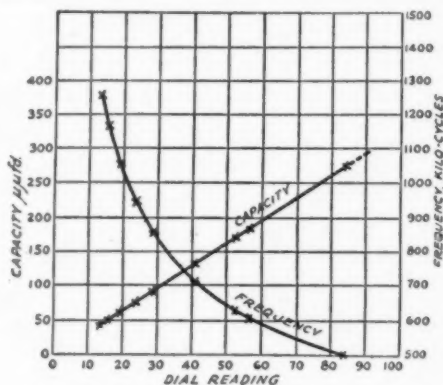


FIG. 1

f_2 . The variables in equation (5) are, therefore, the capacity C and the frequency f .

The capacity for any reading of the variable condenser is then readily obtained; the frequency f corresponding to the reading is taken from the

*1311 Spring Rd., N.W. Washington, D.C.

frequency calibration curve and inserted in equation (5) and the value of C promptly computed. By selecting a suitable number of points a complete calibration curve can be obtained.

This method was tried out using as a standard a small fixed condenser of 206 $\mu\text{fd.}$ capacity. The results were very consistent and a typical curve is shown in Fig. 1.

The precision of the observations may exceed the accuracy of the results, because of the varying effects of distributed capacity and the inductance of the leads, which produce effects that change with the frequency. Laboratory equipment employing low frequencies is necessary where great accuracy is needed.

This method can be applied in numerous instances. After the variable condenser is calibrated it is a simple matter to measure the capacity of other fixed condensers by connecting them in the circuit and determining how much the variable condenser has to be backed off to compensate. Inductances can be measured by applying the relations given in equation (3) and solving for L .

TUNED FILTERS

One type of plate-supply filter which has been largely overlooked by amateurs is the tuned filter, in which the inductance and capacity are adjusted to form a rejector circuit for the ripple frequency. The functioning of this type of filter is similar to that of a common "wave-trap." Alfred H. Turner, W3AUX, of Camden, N. J., writes us as follows concerning it:

"While reading over the *résumé* of d.c. plate supply systems in the June, 1930, issue of *QST* as well as the article entitled, 'ABC of Filter Design' in the April, 1930, issue, it occurred to me that we amateurs are overlooking the advantage to be gained by tuning the filter choke to the major ripple frequency—120 cycles when the rectifier is of the full-wave type operating from a 60-cycle source.

"The tuned filter is becoming increasingly common in broadcast receiver design. In broadcast practice, the filter is usually of two sections in which the speaker field constitutes the second section. The first section is tuned because it is of lower resistance and because all of the rectified current passes through it. If the rectified current contained only the 120-cycle ripple, there would be no objection to tuning the speaker field also. However, since there are objectionable higher harmonic ripple frequencies present, one section is left untuned as a low-pass filter.

"Mr. B. F. Meissner, in *Proceedings of the Institute of Radio Engineers* for January, 1930, described a modification of the straight tuned

choke, in which a tapped choke is used and a small section of it tuned. This arrangement incorporates in a single choke the advantages of a two-section filter one section of which is tuned and the other untuned.

"The tuning of a choke of low resistance is fairly critical and care should be taken that the capacity not exceed the correct value. The inductance of the choke usually varies considerably with the current through it and it is suggested, therefore, that the tuning be done under normal load. As the usual filter choke has an inductance value between 10 and 50 henrys, it requires an approximate capacity of from 0.2 $\mu\text{fd.}$ to 0.04 $\mu\text{fd.}$ for resonance at 120 cycles. If the voltage rating of this tuning condenser, which is usually of the tin-foil and waxed paper type, is made equal to the voltage rating of the input condenser to the section, there is little danger of puncture. The usual input and output condensers of one or two microfarads do not materially alter the tuning of the section.

"It is not too much to expect at least a five-to-one reduction of the major ripple in one section when the small tuning condenser is added. However, this much overall improvement may not be obtained if the tuned section is followed by a good untuned section."

A RECEIVER WITH PUSH-PULL R.F. AND DETECTOR

1930 might be called the "push-pull year" because so much interest is being shown in push-

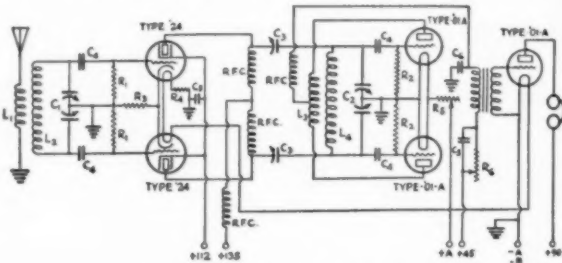


FIG. 2

C_1 —Two midjet condensers cut to 4 plates each with rotors connected. (May be same as C_2 if desired.)

C_2 —1.00- $\mu\text{fd.}$ condenser cut to 4 plates with two stator plates insulated from each other.

C_3 —5-plate midjet.

C_4 —100 $\mu\text{fd.}$

C_5 —0.5 or 1.0 $\mu\text{fd.}$

C_6 —2000 $\mu\text{fd.}$

R_1 —1-megohm grid leak.

R_2 —5-megohm grid leak.

R_3 —750 ohms.

R_4 —1 ohm.

R_5 —10 ohms.

R_6 —100,000-ohm variable resistor.

RFC—Commercial short-wave receiver choke coils.

COIL DATA

Band	L1	L2	L3	L4
28 mc.	3	4	5	4
14 mc.	4	8	5	10
7 mc.	6	16	7	20

wound with No. 22 d.s.c. on Pilot forms (diameter 1 1/2"). Spacing between turns for 28 and 14 mc. on L2 and L4 is adjusted for proper band coverage. No spacing used for 7 mc.

pull transmitters and receivers. In the August Experimenters' Section there appeared a description of a receiver using push-pull screen-grid detectors; this month we have data on a receiver

using a push-pull tuned r.f. amplifier with push-pull triode detectors. The chap responsible for this is R. N. McCord, W9BAY, 300 Nelson Ave., St. Paul, Minn. He writes as follows concerning the circuit:

"By referring to Fig. 2 you will notice that a.c. tubes have been adapted to a d.c. circuit. Type '24 tubes were used in the r.f. amplifier because of their greater amplification. The other tubes are Type '01-A's. Midget variable condensers are used throughout except C_2 , which is a good standard condenser with bakelite strips holding the stator plates. All but two of the stator and two of the rotor plates have been removed, and the stator plates have been separated from each other by cutting the metal tie.

"The most prominent difference noticed when this receiver was compared with other types was the absolute quietness of operation. This was a revelation to me as I live on one of the busiest thoroughfares of the city and with all the racket from passing cars, especially on 14 mc., good reception is at a premium. With other types of receivers it was impossible for me to hear any foreign DX. Now those signals come in almost as good, on the average, as do U. S. stations. On account of the weak background noises, weak signals stand out prominently.

"The next great difference noticed was the comparative r.f. gain on 14 and 28 mc. as compared with other tuned and untuned r.f. receivers. In fact, the percentage of gain on 14 mc. is almost as great as on 3500 kc. This is explained by the utilization of all r.f. energy due to the push-pull arrangement.

"The addition of another tuning control may not appeal to some amateurs, but it does not in any way make the tuning more difficult or complicated. The r.f. tuning condenser, when once set for the different bands, need not be touched except when it is desired to aid in separating signals or to bring in a weak signal. In reality, it is not as hard to tune this type of set as a straight oscillating detector, since it will work over a greater range of frequencies near the oscillating point without adjustment of the regeneration control. Therefore, very rapid tuning is permissible. I have had trouble in getting receivers to oscillate on 28 mc. and higher but this set worked near the 56 mc. region at the first try.

"The coils L_1 , L_2 , L_3 and L_4 are wound on Pilot forms. The windings L_2 and L_4 are spaced in the middle for about $\frac{1}{4}$ " and the primary and tickler windings are wound in the space. It is also best to try spacing the windings L_2 and L_4 to get into the band as the addition of one turn will throw the tuning out of the band. If oscillations do not take place at once try reversing the tickler connections. Even if the set is oscillating it is difficult to tell by the usual method of touching the stator plates of the detector tuning condenser and listening for the 'pluck' when the receiver goes out of

oscillation, or by listening for the 'pluck' when going into oscillation by varying the regeneration control. My experience has shown that the same kind of 'pluck' is heard when the receiver is in a non-oscillating condition when following the above practice. The best method is to use a wave-meter or similar absorption device or by varying the tuning condenser until signals are heard, that is, if the set is working.

"During adjustment the condensers marked C_3 need not be varied for the different bands when the right setting is once found. They should be adjusted to give a maximum energy transfer without causing any reaction on the detector tuning, or by stopping oscillation. The screen-grid voltage is higher than usual but was found to give better signals this way. Aside from the above, no extra precautions are necessary except that complete shielding of the r.f. will be found advantageous."

Exploring the 56 Megacycle Band

By Harry D. Hooton, W8BKV *

Although the 56-mc. band is practically unexplored at the present time it can be the field for some very interesting experiments. Effects that are unnoticed at lower frequencies are greatly exaggerated at these extremely short waves and this is one of many things that make this band interesting to the experim. Most of the 56-mc. apparatus is easily constructed and very economical in cost.

Let us consider the 5-meter receiver. It will need special design and construction, and while this sounds like a job there is nothing "freakish" about it. The usual short-wave circuit will work well at 56 mc. The first rule is the cardinal rule for all high frequency apparatus: short leads. The writer used copper tubing coils, mounting them directly on the tuning condenser to avoid any kind of leads. It is important to use heavy material not only because of increased efficiency but also to reduce vibration. The second step is to reduce capacity between the wiring and the various parts of the receiver. Metal end-plate variable condensers are taboo for this frequency as they have too much capacity effect with other receiver parts. Small "midgets" of the soldered plate variety are best and the importance of soldered plate construction can hardly be over-emphasized at this frequency. Very small capacity between parts of the circuit will often cause a receiver to refuse to oscillate. It is advisable to use coils of small diameter as a 56-mc. coil has a large field.

It is best to eliminate the socket for the detector, soldering direct to the terminals of the tube. This not only eliminates all chance of losses at this point but as different tubes change things greatly

*Gallipolis Ferry, W. Va.

on this band nothing is gained by changing tubes. It is the best policy to select a good tube and design the circuit around its individual characteristics. The Type '12 was used by the writer but '99s have been used with success, although it is a little more difficult to make them oscillate. It is desirable to use separate batteries on the audio amplifier as this centers the trouble hunting in the detector circuit.

Almost any antenna will do for reception of 56-mc. signals, but the coupling should be considerably less than that used at lower frequencies. An antenna about 20 feet long was used here with

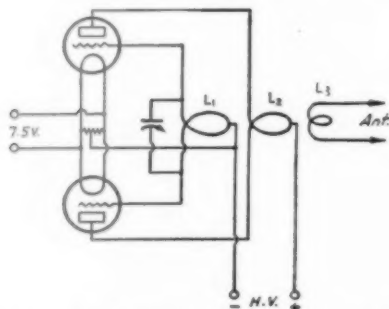


FIG. 3.—THE 5-METER MESNY OSCILLATOR

- C_1 —Tuning condenser. Should have small capacity. A 2-plate condenser with plates separated about $\frac{1}{4}$ " should serve.
 L_1 —1 turn of $\frac{1}{4}$ " copper tubing about 4" in diameter, tapped at center of turn.
 L_2 —1 turn same as L_1 but slightly larger in diameter, tapped at center of turn.
 L_3 —One or two turns, depending on how the antenna is coupled to the oscillator.

These sizes are subject to some modification, as it is difficult to specify exact dimensions at such high frequencies. The values had best be determined experimentally.

success, but a directive antenna identical with the one used for the transmitter gave stronger signals.

Now with regard to the transmitter. The writer used the "Mesny" circuit in all his experiments, and the present transmitter in use at WSBKV is almost identical in design and construction with that used by FSPY at Paris. As shown in Fig. 3 the circuit is of the push-pull type. The transmitter is composed of two tightly coupled coils (grid and plate), the grid coil being connected to the grids of the two tubes and the plate coil similarly connected to the plates. No r.f. choke is used in the plate circuit. Two $7\frac{1}{2}$ -watt tubes are used at this station. The plate coil should have $\frac{1}{2}$ more turns than the grid for proper oscillation. It is advisable to use a low-capacity tuning condenser or the tuning will be extremely critical, making the transmitter hard to adjust.

As the antenna for the transmitter is short, reflectors can be used conveniently. The antenna system in Fig. 4 is quite successful for both transmitting and receiving. It is the single-wire reflector type and considerably increases signal strength.

Some interesting effects were noticed while using the beam antenna described. This is a hilly

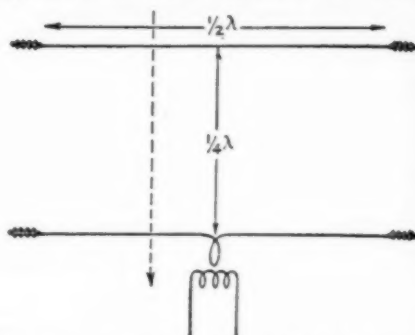


FIG. 4.—THE DIRECTIVE ANTENNA SYSTEM

This is only one of the many forms which can be used. See April QST, page 15. The arrangement above is directive in the plane of the antennas as shown by the arrow. A half-wave antenna will be approximately 2' 10" long.

location and when the receiver was on top of the hills signals were strong, but if on a lower level or behind an object such as a tree or house the signals were blotted out entirely.

The writer would be glad to hear from other 56-mc. experimenters, exchange information and make test transmissions.

ELIMINATING HUM

The question of hum elimination in a.c. receivers is still a burning one and Newton Beall, W3ZY, of Washington, D. C., sends us a good list of suggestions for curing it. Here they are:

1. Don't ground the receiver panel or case, if metal is being used. It is better to use the negative "B" connection.
2. Center tap your filament transformer with a 60- to 100-ohm resistor, and be sure that you have the true electrical center. This can best be checked by a good voltmeter and small battery ($4\frac{1}{2}$ -volt) by obtaining the same reading on either half of resistor. Connect center tap to ground.
3. Try placing your receiving antenna lead-in in inductive relation to the filament transformer or primary supply. Be careful in adjusting this, as you will find a point where bringing the lead-in closer or moving it farther away from the transformer will cause hum to become very pronounced.
4. If an antenna coupling condenser is used, it should be variable and have some means of being adjusted with micrometer precision. Careful adjustment of this condenser will not only spread the band properly but also affects the hum.
5. Make sure your tubes are in good condition, especially the Type '24 if one is being used.
6. Make sure that all 110-volt lines in, around or near the set are covered in some manner such as BX cable is covered and all covers properly

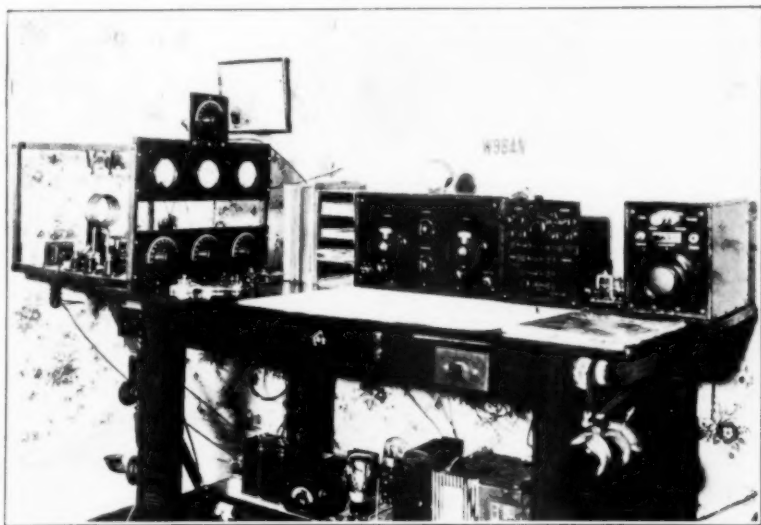
(Continued on page 78)

W9BAN

IN October, 1926, the call W9BAN was allotted to George P. Taylor, of 728 Second Street, Henderson, Ky. The station progressed smoothly for nearly two years. Then one Sunday afternoon in September, 1928, while peacefully QSO Chicago, the op was politely but firmly informed that the house was on fire. Practically everything was burned from the transoms up, and

Type '10 tubes with d.c. power supply, a four-tube receiver, and a calibrated monitor, together with the usual control equipment.

The receiver was modelled after a description in *QST*, with a few changes. It has a screen-grid antenna coupling tube, a regenerative triode detector, and two stages of transformer-coupled audio amplification. The circuit diagram is shown



A VIEW OF W9BAN

From left to right are the transmitter, receiver, battery control panel, key and monitor. The batteries for the receiver and the power supply for the transmitter are on the shelf under the table.

the radio table was piled high with debris and fallen timbers. W9BAN was unquestionably hors de combat. But it really was a blessing in disguise, as the station was rebuilt to a much higher standard.

One year later, W9BAN was the recipient of a direct hit by lightning. (Lightning switches are fine, but unless they are grounded . . .) And a couple of billion volts of concentrated electricity is positively ruthless. It blew everything but the postman's whistle . . . tubes, meters, chokes, transformers, condensers, lights, telephone, relay, and made crude but nearly permanent welded joints on the key contacts. As before, the station was rebuilt and improved. Such were two incidents of a devastating nature in the short history of W9BAN which, though costly, proved to be of decided benefit to the station in the long run.

The present station, a general view of which is shown in the large photograph, is the result of experience acquired during the two previous rebuildings, and consists of a high-C push-pull tuned-plate tuned-grid transmitter using two

in Fig. 1. Regeneration is controlled by a variable resistor. The 15- μ fd. midget condenser in shunt with the 100- μ fd. tuning condenser spreads the 7-mc. band over 93 degrees on the dial. The main tuning condenser covers a much wider range than this, however, so that territory outside the amateur bands can be covered. Since the receiver was built primarily for c.w. reception, maximum distortion was wanted, and high-ratio transformers are used in both audio stages.

The coils are plug-in type, covering 3.5, 7, and 14 mc. Three-inch factory-wound coils are used on the 7- and 14-mc. bands. Half the top of a tube base was cut off and the four ends of the coil were pulled tightly through the tube prongs and soldered. No bolts or bakelite strips were needed, and the coils are very rigid and self-supporting. The last audio stage is cut in or out for speaker operation by a rotary D.P.S.T. switch mounted on the receiver panel. Phone leads are brought under the table and connected to a Yaxley outlet jack conveniently located on the front of the table.

A top view of the receiver is shown in one of the photographs, while the station photograph shows the appearance of the panel. The two National dials control the tuning and vernier condensers,

tors, and is about 6 inches from the nearest antenna coil. No clips are used on the transmitting inductance—all leads are soldered or bolted.

A receiving-type resistor is used for the grid leak and is rated at 0 to 500,000 ohms. It is a variable wire-wound resistor and about one quarter of its full value is used, or approximately 125,000 ohms. This high-resistance grid leak reduces the plate current to 85 milliamperes and probably is responsible for a few of the reports of "xtal d.c." At any rate, it noticeably improves the quality of the signal with but a small sacrifice in power output.

Looking now at the lower panel in the rear view of the transmitter, the variable condenser on the right is in the grid circuit and the two on the left, which are General Instrument transmitting type, are connected in parallel to control the plate circuit. The antenna condenser on the small panel is at the top. The Jewell

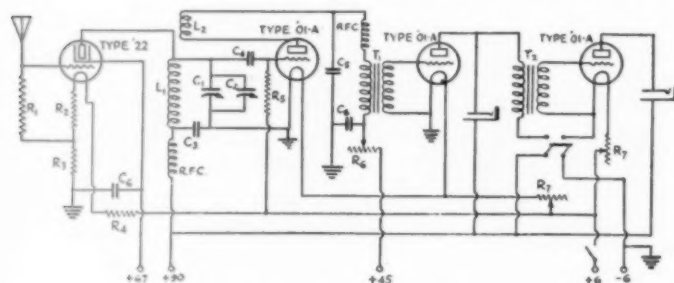


FIG. 1. — THE RECEIVER

C_1 — 100 μ fd.
 C_2 — 25- μ fd. midget.
 C_3 — 4000 μ fd.
 C_4 — 100 μ fd.
 C_5 — 2000 μ fd.
 C_6 — 0.1 μ fd.
 R_1 — 10,000 ohms.
 R_2 — 10 ohms.

R_3 — 5 ohms.
 R_4 — Amperite.
 R_5 — 5-megohm grid leak.
 R_6 — 50,000-ohm variable resistor.
 R_7 — 10-ohm rheostat.
 T_1 — Audio transformer, 10-1 ratio.
 T_2 — " " " 5-1 " "
 RFC — Honeycomb-type coil, $1\frac{1}{4}$ " x $3\frac{1}{4}$ ".

L_A
 3500 kc. 21 turns
 7000 kc. 6 "
 14,000 kc. 3 "

L_B
 14 turns
 4 "
 2 "

on old tube base
 3 in. diameter
 " " "

the filament rheostat and regeneration control resistor being mounted in the center of the panel.

The receiver is in a home-made oak cabinet, 9 x 15 x 7 inches. Body capacity is eliminated by copper shielding. Baldwin headphones are used and are equipped with soft sponge rubber cushions which are very comfortable when the phones are used for any length of time.

The receiving antenna is approximately 80 feet over all and is strung in the attic.

THE TRANSMITTER

The transmitter works in the 7000-ke. band and is usually tuned to a fixed frequency of 7175 kc. In keeping with the "1930" type transmitter it is of high-C design. Two Type '10 tubes are employed in push-pull, using the tuned-grid tuned-plate circuit. An idea of the constructional details of the transmitter can be obtained by inspection of the photograph. Most of the transmitter parts are mounted on the $\frac{3}{8}$ " baseboard, which is 18" x 18". The white pine uprights and cross members are $\frac{3}{4}$ " x $1\frac{1}{2}$ ". The two main panels are 18" x 5" each and the auxiliary panel at the top is 5" x 5".

The plate coil and two antenna coils are mounted on glass rods just back of the meters. The glass rods run through the coils and are spaced so that the coils will be held rigid at all times and yet permit a change in coupling should it become necessary. The coupling is usually $2\frac{1}{2}$ to 3 inches. The grid inductance is permanently mounted "out-of-field" on stand-off insula-

tors on the upper panel are the filament voltmeter, thermo-couple antenna ammeter, and plate milliammeter.

Filament voltage is controlled by an E210 Bradleystat in the primary of the filament transformer. This rheostat is placed within easy reach on the side of the table. An old telegraph sounder equipped with silver contacts serves well as a keying relay.

Christmas tree lamps are used to obtain a center tap on the filament transformer supplying the oscillator tubes. While probably not quite up to date, these lights present one decided advantage over other resistances in tuning. By touching the key very lightly for a short dot, the brilliancy of the bulbs determines the approximate plate current in a fraction of the time required to take a reading on the milliammeter, thus reducing to a minimum the time of excessive loads on the tubes during tuning.

There is a slight knack in tuning the tuned-grid tuned-plate circuit which some amateurs may have overlooked. In tuning the closed circuit the grid condenser is tuned to resonance with the plate circuit, as indicated by the lowest plate — current reading. The grid condenser is then detuned to show an added plate current of approximately 20% or more, by slightly increasing the capacity.

POWER SUPPLY

The power supply is conventional in design. It is visible on the shelf under the operating table in

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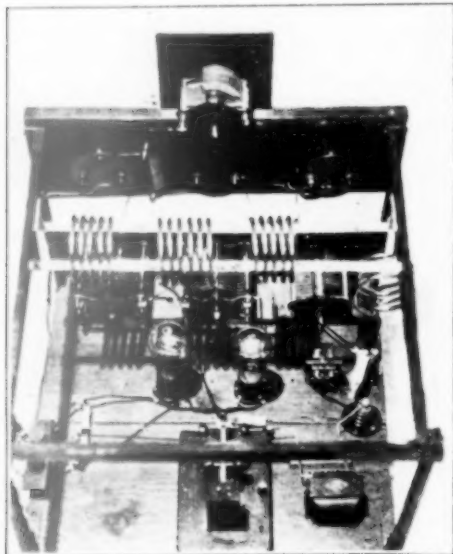
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a six-volt bulb. The meter is panel mounted and enclosed in a thin wooden cabinet.

ANTENNA SYSTEM

The antenna system is a half-wave Zeppelin. The feeders are spaced ten inches and are 34 feet



A REAR VIEW OF THE TRANSMITTER

The central coil mounted on the glass rods is the plate tank coil, the ones on either side of it being the antenna coupling inductances. The grid inductance is mounted on stand-off insulators on the baseboard at the extreme right. Behind the tubes are the keying relay and the key-thump filter.

long from the antenna coupling coils. The radiator is 68 feet long and approximately 27 feet high.

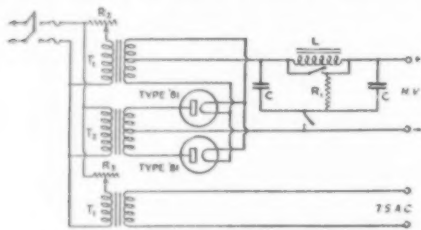


FIG. 3.—THE RECTIFIER-FILTER SYSTEM

- L —30-henry, 150-mil filter choke.
- C —4- μ fd. filter condenser.
- R_1 —50,000-ohm 75-watt wire-wound resistor.
- R_2 —Wire-wound rheostat.
- R_3 —E210 Bradleystat.
- T_1 —7.5-volt filament transformer.
- T_2 —Power transformer, 550 volts each side center-tap.

It is suspended between a 30-foot mast in the back to a 6-foot pipe mast on top of the house, and is practically horizontal. The feeders connect to the top at an angle of 60 degrees. Lead-ins come through G.R. insulators bolted either side

of a board under the window. Six-inch stand-off insulators are at the window and roof-edge of the house. Between these two pairs of insulators the feeders are pulled taut and need no spacers. Only one is needed above this point. Number 12 soft-drawn enamelled copper wire is used for both antenna and feeders.

OPERATION

The transmitter is turned on from the switch panel seen at the right of the receiver. This panel is 9" x 7", and on it are mounted a battery switch for charge position and receiver operation, a 110-volt switch to the dry-disc charger, charge indicator meter with switch, relay, buzzer and ground switch, and a Century high-frequency buzzer. They are all battery switches removed from the porcelain bases and mounted on the bakelite panel. It is very handy to have them mounted in this manner, as they occupy very little space and are readily accessible.

Two dry cells are used to energize the buzzer and two for the relay. Both are hooked directly across the keys. The buzzer is generally left on during operation, as it is an accurate monitor of the fist, and in a psychological way will greatly improve sending. The relay is mounted on a thin rubber sponge, although this precaution against vibration is not wholly necessary, as the push-

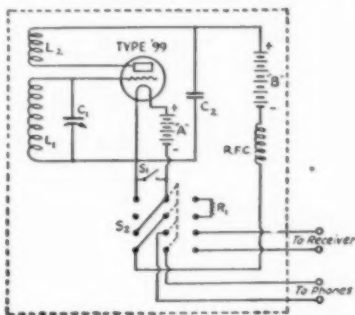


FIG. 4.—THE COMBINED MONITOR AND FREQUENCY-METER

- L_1 —17 turns of No. 28 d.c.c. on old tube base.
 - L_2 —12 " " " " spaced 3/16" from L_1 .
 - C_1 —Double-spaced 3-plate condenser.
 - C_2 —1000 μ fd.
 - R_1 —3000 ohms.
 - RFC —160 turns of No. 28 d.c.c. on 1/2" form.
 - S_1 —Battery switch.
 - S_2 —Federal 4-pole double-throw toggle switch.
- Dotted lines represent shielding.

pull circuit is very stable and apparently is entirely free from creeping, chirps, or the dreaded "wobulation." The addition of a small key-click filter was the last touch to banish forever the old nickname the BCL's once gave the station, "Broadcast All Night."

To the left of the receiver are four small "pigeon holes" made from aluminum plates.

(Continued on page 52)

I.A.R.U. NEWS

Devoted to the interests and activities of the
INTERNATIONAL AMATEUR RADIO UNION

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Vice-President: C. H. STEWART

Secretary: K. B. WARNER

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Nederlandsche Vereeniging voor Internationaal Radio-amateurisme

New Zealand Association of Radio Transmitters
Norwegian Radio Relay League
Radio Society of Great Britain
Reseau Belge
Reseau Emetteurs Français
South African Radio Relay League
Wireless Institute of Australia

Conducted by Clinton B. DeSoto

THE principal matter under consideration in the June Calendar of the I.A.R.U. as sent to the member-societies, is a discussion of policies in anticipation and preparation for the Copenhagen and Madrid conferences on international radio affairs. We are at present principally concerned with that at Copenhagen, which will be held in the spring of 1931.

The *Rede dos Emissores Portugueses* is proposed for membership with this Calendar, and we hope soon to be able to welcome this active society and its enthusiastic membership into the Union.

We record two additions to the list of QSL Forwarding Bureaus of the world, published in this department of the November, 1929 issue of *QST*.

Cards for Norwegian amateurs can be sent to the Norwegian Radio Relay League, Industriegaten 30, Oslo, Norway.

Cards for amateurs in the Dutch East Indies can be sent to the N. I. V. I. R. A., Traffic Department, Egb. A. Krygsman, c/o Bataafsche Petrol Col, Boela, Ceram, Dutch East Indies.

Cards for Egypt, Iraq, and Roumania can be forwarded via the A.R.R.L.

Further information on QSL-Services is to be found in the national section reports in this issue.

J. W. Jennison, VK2JJ, recently achieved WAC membership with 3 watts input from "B" batteries to a UX-201-A in a t.g.t.p. circuit. His reports were all excellent, pure d.c. QSA 3 being the poorest, and QSA 5 from Africa the best.

The first reaction to the suggestion offered in this department of the July issue of *QST* con-



GENERAL ASSEMBLY OF THE U.S.K.A. (SWITZERLAND) AT BERNE, MARCH 30, 1930

The large fellow in the center of the front row is the President, Deyler, 9D. To his left (your right) is Dr. Schoenlank, the Secretary, and on the other side, to his right, Schneeberger, 9G, Traffic Manager. On Dr. Schoenlank's left are respectively Van Burgen, QSL Service, and Wolf, Treasurer.

cerning abbreviation of the names of principal cities, comes from Art Bates, well known for QRA's and W9FO.

He points out that too many messages are "lost, strayed, or stolen" under present conditions because the receiving operator merely guesses at the name of the town, and also enters a plea for the hundreds of cards undelivered because of improper address, "no such post office," etc. The time and effort necessary to send a few more characters and thus insure *correct* reception of the name seems to him well worth while, especially where operators are of different nationalities.

Will we hear from any defenders?

The South African amateurs are now using the prefix "VP." Although no official intimation that this is in order has been received, it is obviously more correct than the old intermediate "fo." "VP" is also being used in Southern Rhodesia, and will be their prefix in the future.

A surprisingly large number of WAC certificates has been issued recently. At this writing the number issued since the WAC Club was assumed by the Union is well over one hundred,



YSIFM, OWNED AND OPERATED BY J. FREDERICO MEJIA, SAN SALVADOR, REPUBLIC OF EL SALVADOR, CENTRAL AMERICA, "WHERE THE BEST COFFEE GROWS!"

This station, which operates in the 7-mc. band, uses one Type '93-A as oscillator, fed by 1000 v. pure d.c. at 100 mls. The receivers are both R.C.A., being, left to right, types AR-1496-D and AR-1145. The loud-speaker is an R.C.A. A-100. The owner is an E.E. and Assoc. A.I.E.E. He is chief of the Radio Division of the Government of Salvador.

and, at the rate they are going now, it will be close to 150 when these lines are read. Remember that's only for 1930 — and in addition we have WAC's for 'phone, and have promised one for 28-mc. contact. International communication is rapidly becoming commonplace.

BELGIAN NOTES

By Paul de Neck, Pres., Reseau Belge

This summer brings us especially bad propagation conditions on all hands.

The June International 28-mc. Tests showed no results from our amateurs. There were four Belgian stations on this band every Saturday and Sunday afternoon, but they were unable to hear or work anyone. Only a few harmonics from 14-mc. stations working locally came through. ON4CK, ON4RO, ON4AU, and ON4UU were the active stations.

The best work on 14 mc. has been done by ON4JB, who worked five continents with only 3 watts input. His set is an m.o.p.a. arrangement with the push-pull stages capacity coupled. Two Dutch A.409 tubes are used as oscillators and two B.406 tubes as amplifiers, with 120 volts

at 30 mls on their plates. A Zeppelin antenna about 60 feet high is used.

ON4FT wishes to point out that the official call just granted him for his sailing yacht *Tenacity* is ON4FX and not XON4FT, as reported in these pages previously.

DANISH REPORT

From the Experimenting Danish Radioamateurs

Receiving conditions on 28 mc. have been entirely hopeless, the only stations heard being local Danish amateurs. Several OZ stations were on the air for the June tests on this band.

On 14 mc. conditions have been very unstable, contrary to our experiences with early spring in previous years, when it has regularly been possible to work North and South American stations every evening.

Contact with South Africa will soon be impossible until Autumn comes again. New Zealand has not been heard much, while Australia has come through regularly on Sunday mornings, quite a number of contacts having been effected.

It has been interesting to note the variation in conditions from year to year, but we hope that conditions on 14 mc. will soon become stable so that regular contact with North and South America will again be possible.

Conditions on 7 mc. have also been very peculiar. In the daytime European contacts are always easily possible, but nearly every evening has been quite dead, only faint DX stations being heard.

On a few evenings European contacts have been excellent, but very little DX has been heard or worked, and one has the impression that 7 mc. is no longer used for DX.

On 3.5 mc. everything has been normal; the band is chiefly used by 'phone stations, but seems to be becoming more and more popular for European contacts, many of these being effected every day.

DUTCH NOTES

By H. Pomes, Ass't Traffic Manager N.V.I.R.

(We preface this report with an announcement of the election of new officers in the N.V.I.R.)

J. Corver, Burnierstraat 38, The Hague, is the new President.

W. Tappenbeek, Hotel de l'Europe, N. Doelentstraat 2-4, Amsterdam C, is the address of the Secretary-Treasurer.

(QSL cards should be sent to the QSL-Service, Post box 400, at Rotterdam — C.B.D.)

During the latter spring months, reception was rather poor, and the activity of the Dutch amateurs, we are sorry to say, was confined to a

(Continued on page 66)

SEPTEMBER, 1930

QST

57

Calls Heard



ZL1FU, G. D. White, Bridge St., Poltiki, N. Z.

14,000-ke. band

w1ajv w1akg w1akv w1apq w1aqs w1aqt w1asf w1awk
w1ase w1bft w1bsm w1bux w1dp wipe w1pi w1zz w2afb
w2arb w2avj w2ayj w2biv w2bg w2box w2bys w2ced w2el
w2qn w2rs w2zg w3aaz w3aqi w3arp w3cdl w3jm w3ut
w4ly w4mk w4mr w4pau w4um w4wz w5aak w5aot w5qu
w6afi w6aqj w6bax w6btj w6bb w6chy w6cuh w6cxw w6dev
w6de w6drb w6dtz w6dwi w6egh w6ew w6ejc w6jn w6vz
w7ajj w7ait w7be w7pi w7ty w8adm w8bet w8bf w8bv
w8cag w8cew w8cut w8ddr w8djv w8dyk w8lf w8fs w8uf
w8aza w9ces w9ecz w9eqt w9eve w9dgg w9flh w9ghh w9io
ac1bd ac1ts ac8hm ac8wb au8at celah ce3ch ce5aa cm8uf
cp1aa ct1aa ct1bx ct2aa exlap d4aez ear21 ear65 ear96 ear98
ear116 ear136 eu3kac f8axq f8aw f8ef f8ex f8faf f8fk f8gdb
f8ko f8sua fm8er g2gm g2lz g5by g5ba g6rl helffg hc2im
jldp j2rb kalkm kaldj k6acw k6ceu k6erh kfu5 lu3fg
ludq lufaj oafce oafj oafj oafq oafu oafz oafz oh2nm
ok2va on4be on4fp on4sz pa0qf pk1jr pk3bp pk3bm pk4az
py2bg py2sb au8rs velar ve1dq ve2be ve2ca ve3eo ve4gk
ve4bx ve5aw vs6ag vs7ap vu2dg x9a xu2uu yslap xg2xc
wfat wftb

AU1AO, Viktor Solomin, Sennaja St. 57, Bijk,
Siberia, U. S. S. R.

aalbh ac1sn ac1tb ac1bd ac2ek ac2aj ac2al ac2pw ac2ff
ac2aa ac3ghe ac3ma ac6ag ac7rot ac8rv ac8aw ac8umf
ct1aa d1aar d4abg d4un d4dbd d4gq earl ear110 f8kco
f8pbo f8klm f8swg f8acj f8rot f8l f8gsa f8xh f8gdb f8ax
f8ers g5vl g6up ha3bk ilfu ilge ijll j3ck j2nk kalaz kalrs
kalbd kalaf kalaw ohleo oh2os oh2da oh5nz ok1ro
ok1we ok1rb ok1rf ok2va on4np on4fm on4bs on4rv on4us
on4je on4gq on4gm pa0gt pa0gw ry1x sp3cj sp3mb sp3ao
sp3yl sp3ar sp3dl sp3sl tf5au vs1eb vu2dg vu2by vy2kx
vu2az w5aw w2boa yi2dg y12as ym4zo zl2go zllac z13aj
zl3bl

VK5GR, G. B. Ragless, South Rd., St. Mary's,
South Australia

7000-ke. band

wlkn w1fx w1vp w1asf w1bes w1ws w2ayj w2bak w2exl
w2uk w3ahp w3ajd w4aaq w4ahl w4ft w4oc w4qv w5zav
w5ww w6aaz w6dpf w6car w6bbd w6bfb w6epz w6bax
w6bad w6cg w6cnx w6ehi w7be w7ev w7kt w7iv w7de w7afl
w7gp w7pf w7el w7ry w7nr w7mo w8adg w8bfc w8gz w9ap
w9um w9eph w9gdh w9yc ve2ca ve3cz ve4bl ve5aw vs1ab
vs8mc oh2gp ac1bd ac8cw earl ear94 f8ex g5tz k4acf

14,000-ke. band

w1bwa w1aep w1vz w1cow w1bds w1aqt w1asf w1bux w2fl
w2bx w2czg w2amm w2el w2qn w2bda w2amr w2bxw
w3cuq w2bv w2ayn w2hq w2afr w2bwc w2auu w2bak w2ai
w2vd w2aef w2sn w2abu w2oa w2byr w3auo w3ln w3agj
w4fr w4ft w4ql w4agr w4kh w5ben w6aoe w6dev w6chy
w6bax w8dgp w8bto w8ddk w8apb w8cum w8afm w8cag
w8bei w8bb1 w8ayw w8cut w8ef w9ka w9dra w9gta w9cps
w9ets w9cou w9bba w9dbj w9mt w9ams w9ftz w9ghh
w9dee w9aja w9cum w1jr w1cmx wipe ac1bd ac8jk ac8ag
ac8ls acx1hn au8at cm8uf ct1aa ear59 f8cs f8bx f8fem f8whg
f8sua ear59 eu5x g5by g5bz g5sz g5ml g5pj g6rb g6xb oafj
oafz oafj on4fp ok2si kaljr pk4az pk3bm pa0qf pk4na vs6ab
vs6ag vs3ab vo2az vt4vz vq4tna ve9sj sp1ae sp3yl sp3pb
su8rs x9a y1llm oh2nm un1ce z5fx z5sq wfat

K6CIB, L. A. Walworth, 11th Signal Co.,
Schofield Barracks, T. H.

w1bes w2vy w2byp w2exl w2hj w3fq w3hy w4akm w4aiq
w4lj w4hy w4is w4agd w5ty w5bek w5axx w5bdz w5beb
w5uf w5aqe w5bny w5ana w5axs w5dap w5any w5cyp
w5efd w5of w5pr w5hh w5egk w5dvq w5gdv w5ke w5gfk
w5egdh w5ebo w5adp w5cxy w5ces w5gka kalaw kalhr
k7ch k7pb ve4bq ve4bv ve4go vedj vk2jt vk3rg zl2gy
jldq helte

W. A. W. Stevens, 75 Wilson St., Hawera, New
Zealand

3500-ke. band

ve3gn vkg vkgv vk2yb vk2kg vk3za w1ajt w1ayi w1bdx
w1by w1dx w1gs w1pi w1ps w2aae w2ael w2vv w3aaav
w3nu w4ax w4ll w4ut w5ags w5ap w5blv w6abe w6abf
w6acv w6ak w6alx w6bbf w6bem w6bic w6bj w6bne w6brw
w6cgy w6czx w6cfa w6cjm w6dli w6dnl w6dyk w6eef
w6et w6igy w6fp w6fpr w6mke w6kx w7aad w7aar w7acq
w7amp w7dp w8cif w8cmw w8cnw w8cuy w8dra w8ej
w8ey w8hd w9agb w9awe w9baa w9bes w9bnr w9efb w9egh
w9eic w9dex w9dtk w9dxy w9ebx w9emb w9evd w9flf
w9fkm w9fqg w9fsc w9fyv w9gdt w9ks

7000-ke. band

ac1bx ac1ts ac3bd ac8ls ac8tj aurt2a aulbo au6er au8er
bam bbal cm8lc cn8eis earl ear116 ei9ai ei9l eu2kzh eufk
f8af f8auj f8fb f8gdb f8xz f8lgb f30en fil fm8fs fnih g2sa
haf9af jldn j2uc j3eq j3er j3et j6ta j9zl ohan ok1na
om1tb rx1aa sslaz sar9 ve3kp ve4bv ve4cu ve4gd ve4gf
ve4jg ve5al ve5dd ve5fs vp9aa vp9r vs3ab vs6ae wfat wftb
x29a xam xim yalxa z5zc as2w kalaf kalce kalem kaldj
kaldp kalel kalgo kalhr kaljr kalre kalrh kfu5 k4dh
k6avl k6acr k6boe k6bxw k6bbe k6bzx k6cib k6dv k6dyc
k6evm k6evw k6ewb k6erh k6oa k6bt k7ans vk2ak vk2aw
vk2by vk2cj vk2ex vk2dy vk2dw vk2dh vk2dz vk2dj
vk2ek vk2fp vk2gx vk2gy vk2jg vk2jh vk2hu vk2hw
vk2hb vk2hm vk2he vk2hl vk2hj vk2je vk2ji vk2jo vk2jj
vk2jz vk2jt vk2ks vk2ku vk2kg vk2kh vk2kj vk2ka vk2kl
vk2kx vk2le vk2lf vk2mr vk2ns vk2nw vk2ow vk2ra
vk2rb vk2rf vk2ru vk2rw vk2ak vk2wd vk2wp vk2wu
vk2xw vk2yk vk2zh vk2zn vk2zr vk3aj vk3ab vk3ag
vk3bw vk3cj vk3cm vk3cw vk3de vk3es vk3ew vk3gt
vk3gu vk3hk vk3hm vk3hr vk3hw vk3jk vk3ju vk3ky
vk3lu vk3jg vk3lv vk3mr vk3ot vk3pa vk3pm vk3pp vk3rb
vk3ru vk3rj vk3vp vk3wk vk3wj vk3xi vk3za vk4af vk4am
vk4br vk4bs vk4cm vk4cg vk4do vk4gh vk4gj vk4jb vk4jo
vk4ju vk4kx vk4kg vk4km vk4mf vk4pn vk4pr vk4rp vk4rk
vk4wk vk4xn vk4z vk5bj vk5de vk5dr vk5dx vk5hg
vk5it vk5jk vk5lk vk5mb vk5rx vk5wa vk5wi vk6fl vk6fm
vk6wp vk6wr vk7ch vk7dx vk7lj vk7lw vk7wi vk7wm w1ack
w1afa w1axx w1bzy w1bxm w1bes w1biz w1caa w1cek
w1cei w1de w1dn w1er w1mo w1ag w2afo w2ajp w2ayb
w2bpx w2bta w2bne w2bnx w2bda w2bno w2bxj w2bds
w2beq w2cg w2dw w2gz w2mb w3agw w3awm w3ba w3dh
w3qw w3ut w4aiq w4akg w4al w4aeq w4cq w4ew w4gx
w4hd w4hu w4iv w4jd w4ll w4mh w4mm w4vw w5ajj
w5alf w5aea w5afn w5atf w5af w5bek w5fb w5fn w5gi
w5lj w5ly w5mn w5pg w5ru w5tx w5uf w6ama w6auj w6auu
w6ahp w6aga w6acs w6akp w6af w6amz w6ake w6acf
w6ael w6aee w6azd w6anl w6az w6akf w6axe w6axm w6aos
w6bzz w6bpx w6bqy w6by w6bpm w6buk w6bi w6byz
w6bnc w6bvs w6bhr w6bgh w6bpo w6bfr w6bdi w6bfb
w6btm w6bwi w6byb w6bpf w6bjd w6bip w6bec w6bkx
(Continued on page 84)

Correspondence

The Publishers of QST assume no responsibility for statements made herein by correspondents.



Looking Across at You

1 Boulevard Haussmann,
Paris, France.

Editor, QST:

Bobbie Burns once said, "Oh wad some power the giftie gie us — to see oursel's as ithers see us." No one, particularly if engaged in any kind of technical work, should ever resent a square and honest opinion of himself, if that opinion comes from a source capable of competent judgment.

I have been collecting the opinions of some of my European "ham" friends. They should at least amuse and also give food for thought.

The European ham looks at you chaps with a sort of wistful envy. He reads the advertisements (particularly the "bargain" ones) in QST and moans. The average OM here lives on a salary that would make the poorest of you blink. His choice of equipment is limited and stupidly expensive.

He has the real ham spirit and that keeps a good head of steam in his boilers. Instead of whining at his difficulties he rolls up his sleeves and smashes into them. When you hear a Continental European signal you may be utterly sure that it is the result of labor, mental and manual, the like of which you have never experienced.

I visited an "F" station yesterday. He had two, thirty-watters in push-pull, and the construction work looked as if it had come out of a jeweller's shop. Fixed and variable condensers, all meters, all transformers and chokes — in fact everything except the tubes — were home made — and a lot better job than a good many professional ones I have seen. This man is a very low-salaried office-worker with no formal technical training, but, from his own study and pains, he had full data, curves, all dope on inductance ratios, condenser factors, coefficients of coupling and impedance matchings worked out to three decimals of perfection.

The fellows over here always hand you a whale of a big bouquet, but they feel that your results are in most cases due to lots of available information, lots of inexpensive and varied sources of equipment and — lots of money. They feel that they have you stopped on the pure engineering side.

This is a day of technical precision, and one hopes that the little band of men who cannot only make the old works mote, but who can also tell you exactly why it does, will grow.

— Jack Paddon

Kc. or kHz.?

Caen Van Necklaan 227,
Rijswijk, Z. H.

Editor, QST:

Unnecessary to say, I'm as full of admiration for your fine paper as everybody else, but just this fact urges me the stronger to protest against one inaccuracy. Some time ago you pointed out to all hams that it is much better to speak about frequencies than wavelengths, and the whole world has followed your example. But when speaking about frequencies, we mean the number of cycles per second, in any case the number of cycles in a certain time, and therefore it is wrong to speak about a frequency of, for instance, 14,300 kilocycles; one should speak about kilocycles per second, abbreviated kc/s. Nobody would speak about coulombs instead of amperes, but neither should we speak of kilocycles when we mean kilocycles per second.

Now we have a new name for this unit, the Hertz, abbreviated Hz, which was internationally adopted by some congress. As Heinrich Hertz was without doubt an eminent and leading figure in physics, and as it is easier to type and print kHz than kc/s, I think you had better adopt it, too, before you lead all hams in the world astray by the wrong unit, the kilocycle, which you are using to-day.

— W. Keeman, PA0ZK.

While agreeing with the author of this letter on the merits of the term "kiloHertz" as a unit of frequency, QST is inclined in this respect to follow the recommendations of the Committee on Standardization of the Institute of Radio Engineers, which is still at work in collaboration with other agencies in the standardization of radio definitions, nomenclature, measuring practice, etc. The current recommendation of that committee gives the meaning "kilocycles per second" to the abbreviation "kc.", exactly as attaches to the abbreviation "kHz." The "kiloHertz" is not yet a recognized unit of frequency either in this country or in the international literature, and for that reason QST does not use it.

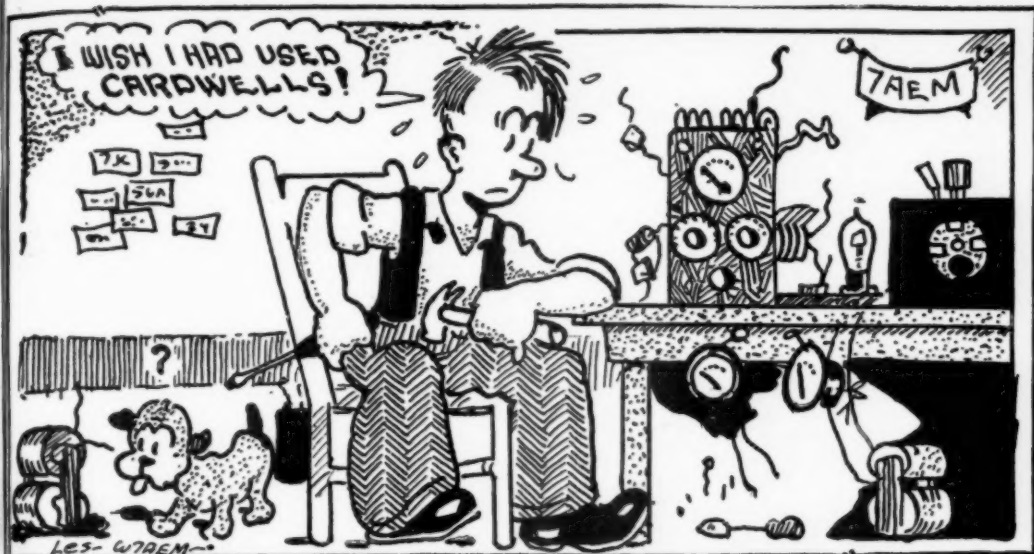
— EDITOR.

This Business of Power Supply

West Lafayette, Ind.

Editor, QST:

It has been my pleasure, during the several years that I have been interested in amateur



"THE PROOF OF THE PUDDING"

"A few days ago a young man brought to me one of your model .0005 condensers that has seen about 7 years of service and is still good for that many more. It has been rebuilt, cut down to 3 plates and remodeled so many times that there is practically nothing left of the original stator assembly of 10 plates. Please advise if you can furnish the complete stator assembly of ten plates, and the cost. It has previously served in countless numbers of receiving sets and is now going to be used in a low power amateur short-wave transmitter."

—From a letter received by us, now on file.

IT PAYS TO USE CARDWELLS

CARDWELL CONDENSERS

TRANSMITTING—RECEIVING
SEND FOR LITERATURE

THE ALLEN D. CARDWELL MFG. CORP.

81 Prospect St., Brooklyn, New York

Since Broadcasting Began

"THE STANDARD OF COMPARISON"

Say You Saw It in QST — It Identifies You and Helps QST

Cunningham RADIO TUBES



Tested and Proved True

There must be some GOOD reason why Cunningham Radio Tubes continue, year after year, to maintain their high standing with amateur engineers and the public alike.

They stand the "acid test" for in-built quality.

E. T. CUNNINGHAM, INC.

New York Chicago San Francisco
Dallas Atlanta

radio, to visit a large number of amateur stations throughout the country. I do this with one purpose in mind, namely, to get ideas that might be of benefit to me and consequently make my station better.

All kinds of layouts may be found. Some are neat and efficient, while others are not; some are permanently built and some are in the experimental stage. A large percentage of amateur stations are laid out well with fine ideas incorporated, but many are constructed about a lot of queer and radical ideas.

One point that strikes me as worthy of more attention is the power supply for the transmitter. A large majority of us are not rich and consequently want to have just as good a station as can be afforded and with as much power as possible. But do we all know how to select our equipment with good reasoning and common sense?

If we put a given amount of power into our antenna it does not make a bit of difference whether this power is supplied by a lot of 210's, an 852, or a 204-A. Of course all of us like to have a big tube—it looks nice, for one thing. But what is the sense of having a high-powered tube in a transmitter if the power supply is unable to load it up to its rating? The power supply is more likely to be slighted than any other one thing in an amateur transmitter.

For instance, a friend of mine has recently installed an 852. Prior to this time he was using two 210's in parallel. His set now works to his complete satisfaction although he gets out very little better than formerly. The reason for this is that his present plate supply equipment is so light that when the 852 is drawing normal plate current, the tube is actually getting 1100 volts. However, he adjusts his circuit so that the tube draws 75 milliamperes, and is happy because he has a 75-watt tube working in his set. He knows, or should know, that he is getting little more output than formerly, but his set is more "showy."

How many of us are doing this same thing? There are many, because I have visited a lot of typical stations. I would venture to say that half the fellows operating radio transmitters are unaware of the actual voltage on their tubes.

In order to get the most from any tube it is necessary to work it at its rating. A tube operating at half rated voltage will deliver less than one-fourth rated output, under ordinary conditions. There is no reason for spending a lot of money on a big tube unless you are able to go ahead and get a suitable power supply. Adequate power at the proper voltage for the transmitting tube with good regulation are the things that count, and they can be obtained only by the use of a husky and well-designed power supply. A 210 properly loaded is better than an 852 with a poor power supply.

— F. J. Smith, ex-W9FOO

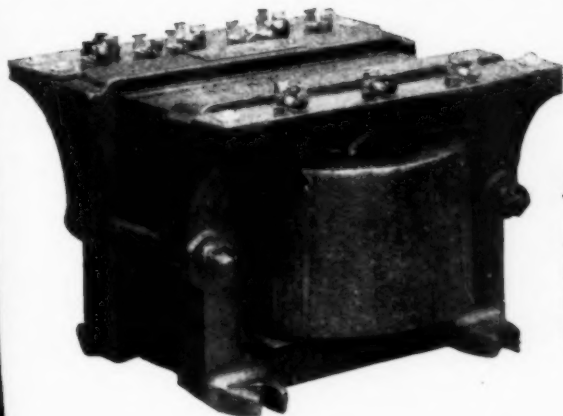
The Board's Phone Policy

Detroit, Mich

Editor, QST:

Just read your editorial in July QST and think the Board's recommendations were wise ones. I

AMERTRAN



Equipment

Designed to meet the new amateur requirements of an adequately filtered D. C. current supply.

Filament Heating Transformers

Voltage regulation within 5%. Note insulation test voltage.

Type	V. A.	Cycles	Line Volts	Sec. Volts	Sec. Amps.	Test Voltage	Type Tube
H-4648	12½	50 60	200 230	2.5/1.25	5	12,000	—66
H-66A	25	50 60	100 115	2.5/1.25	10	12,000	—66
H-4649	37½	50 60	200 230	2.5/1.25	15	12,000	—66
H-4650	50	50 60	100 115	5/2.5	10	12,000	—72
H-4651	50	50 60	200 230	5 2.5	10	12,000	—72
H-4652	100	50 60	100/115	5 2.5	20	12,000	—72
H-4653	150	50 60	200/230	5 2.5	30	12,000	—72

Plate Transformers

P-4656	290/415	50/60	100/108 115/125	2360 1180	O.175	6,000	two 211 two 845
--------	---------	-------	--------------------	--------------	-------	-------	--------------------

The above Plate Transformer is designed to deliver 1000 volts D. C. with the average filter. Other Plate Transformers can be furnished upon receipt of specifications giving your requirements.

Choke Coils

Many standard size Choke Coils available for transmitting circuits.

Amertran Radio Parts have long been recognized as the highest quality. Amateurs obtaining the best results realize their value.

Write for Bulletin No. 1066.



**AMERICAN
TRANSFORMER COMPANY**
172 Emmet Street
Newark, N. J.

Say You Saw It in QST — It Identifies You and Helps QST

THIS COMPLETE TREATISE



ON THE ELECTROLYTIC FILTER CONDENSER

Perhaps the first ever published, contains live up-to-date information that should be in the hands of every transmitter operator, for it shows how most effective transmitter filters can be built.

In successive chapters it deals with the various filter condenser problems and their solutions. Voltage surge effects, condenser life limits, moisture, safety-valve action, cost and size, are carefully and completely analyzed.

It is replete with diagrams and photographs illustrating the important points, and contains a complete description of the latest developments of Mershon Electrolytic Condensers, showing in detail their construction and characteristics.

Although regularly priced at 10 cents, we offer this booklet **FREE** to *QST* readers. Send for your copy today.

USE THE COUPON
BELOW AND GET THE

NEW MERSHON BOOKLET

The Amrad Corporation
320 College Avenue
Medford Hillside, Mass.

Gentlemen:

Please send me a copy of your new booklet, "Puncture Proof Filter Condensers" without charge.

Name

Address

particularly endorse the decision not to ask for definite specifications as to apparatus.

Experience certainly teaches that circuits and specifications mean very little as compared with construction, adjustment and operation.

During the past six months I have practically given up phone work except on 14 mc., and certainly hope that the recommendations of the Board are put into effect so QRM on 3500 kc. will be reduced to a point where some effective work can be accomplished.

— C. H. Vincent, W8RD

Off-Frequency Operation

Glendale, Calif.

Editor, *QST*:

After reading numerous letters in your columns concerning off-frequency amateurs, I have spent considerable time checking some of them. I find a few off-frequency amateurs and, when possible, I have called them and helped them rectify their deviation. I also find the majority if not the entirety of the offenders are beginners who, not being skilled in the tuning of a transmitter, unknowingly slide off. The only way to become 100% is to pull together and help the off-frequency fellow ham.

While these so-called commercials are gnashing their teeth over a little QRM, let's reverse the situation. In the past month I have copied seven of the supposedly "on frequency" commercials wandering around our bands, to say nothing of the dozen or more commercial J's, X's, etc., who operate daily schedules in the center of our 7000-kc. band.

The mush and parasitic harmonics of the rip-saw alternators used by some of these commercials don't add a great deal to the pleasures of amateur radio. The majority of the commercials who run twenty-four hours a day in order to hold the frequency assigned them should give the poor over-worked V-wheels a vacation at least long enough to give themselves time to look up the act concerning unnecessary or superfluous signals.

— Maurice E. Kennedy, W6BGC

A.R.R.L. Headquarters solicits reports from amateurs who log non-amateur stations operating in our bands. Several such stations have been moved as a result of protests to the stations or governments concerned, and we are just as insistent that non-amateur stations shall stay out of our bands as that amateurs shall stay in them. The fact that a commercial station does not stay on its assigned frequency, however, is no excuse, legal or otherwise, for amateur off-frequency operation, nor does it make an amateur who wilfully or carelessly operates outside the bands a bit less culpable. — EDITOR.

Rotten Plate Supplies

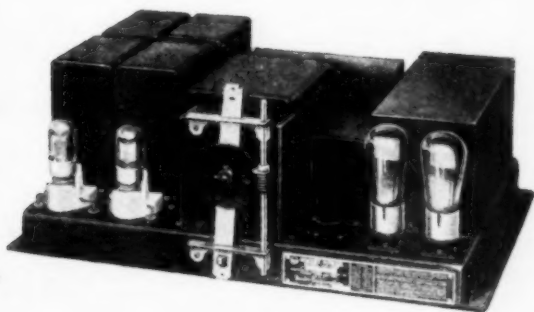
Iota, La.

Editor, *QST*:

I wish to voice a protest against the use of raw a.c. on any kind of self-excited ham rig.

It seems to me that instead of getting better

RELIABLE POWER SUPPLY FOR AMATEUR TRANSMITTERS



SPECIAL

No. 404
STROMBERG-CARLSON
POWER PLANT
Price, F. O. B. Rochester,

\$35.00
Less Tubes

FOR all amateur operators, who wish to secure a very economical, and a very reliable power supply, we have on hand a limited number of our No. 404 Socket Power Plants. This power plant was used in conjunction with our best radio receiver before the advent of the new AC heater type tubes, and was designed for continuous operation with a good margin of safety. It consists of the following components:

One 250 watt transformer, with the following windings: 115 volt primary, 1100 volt secondary with center tap, two 7.5 volt filament windings, one 120 volt winding with center tap, and one 1.5 volt winding; four 22 henry chokes with a DC resistance of 20 ohms, 300 M. A. current capacity; two 25 henry chokes with a DC resistance of 700 ohms and 100 M. A. current capacity; one condenser block containing three sections of 4MFD each 1200 volt working voltage, and two sections of 4MFD each 175 volt working voltage; one primary rheostat 17 ohms; 25 watt resistors of the following sizes: 976 ohms, 4182 ohms, 137 ohms, 1400 ohms, 1220 ohms, and a 60 ohm potentiometer to be used on the filament winding of the radio tubes to give an exact adjustment of the center tap; two UX sockets for the rectifier tubes. A primary switch is included, and two line receptacles, both being controlled by the switch. All of the equipment is mounted on a steel base with neat covers on the parts, and sub-base wiring which is readily accessible. A wiring diagram of the unit is sent with each plant, showing the proper components to use for a 500-volt plate supply when using 216-B rectifiers. Any of the parts can be used, however, for any type of work for which they are adapted.

The unit with its present hookup makes a splendid power supply for 5, 10, 20, 40, 80 and 150 meter transmitters.

(Mail the Coupon)

STROMBERG-CARLSON TELEPHONE MFG. CO.,
ROCHESTER, N. Y.

COUPON

Stromberg-Carlson
Telephone Mfg. Co.,
Rochester, N. Y.

Send me the No. 404
Socket Power Plant in accordance with this special offer. Enclosed find remittance for \$35.

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR MORE THAN THIRTY-FIVE YEARS

Say You Saw It in QST — It Identifies You and Helps QST

Your A. R. R. L. EMBLEM



The League Emblem comes in four different forms. Its use by Members is endorsed and encouraged by the League. Every Member should be proud to display the insignia of his organization in every possible way.

THE PERSONAL EMBLEM. A handsome creation in extra-heavy rolled gold and black enamel, $\frac{1}{2}$ " high, supplied in lapel button or pin-back style. The personal emblem has come to be known as the sign of a good amateur. It identifies you — in the radio store, at the radio club, on the street, traveling — you can spot an amateur by it. Wear your emblem, OM, and take your proper place in the radio fraternity. Either style emblem, \$1.00, postpaid.

THE AUTOMOBILE EMBLEM. $5 \times 2\frac{1}{2}$ ", heavily enameled in yellow and black on sheet metal, holes top and bottom, 50c each, postpaid.

THE EMBLEM CUT. A mounted printing electrotpe, the same size as the personal emblem, for use by Members on amateur printed matter, letterheads, cards, etc. \$1.00 each, postpaid.

THE "JUMBO" EMBLEM. How about the shack wall or that 100-footer? Think of the attention this big yellow-and-black enamel metal emblem will get! $19 \times 8\frac{1}{4}$ ", same style as Automobile Emblem. \$1.25 each, postpaid.

**The American Radio
Relay League
Hartford, Conn.**

notes as times go on we hear worse notes than ever. The latest regulations of the Federal Radio Commission seem to leave the impression with some hams that an a.c. plate supply is the latest thing. QRM on the 7-mc. band is becoming unbearable on account of the pollution from raspy and buzz-saw notes spreading over several degrees on any ham receiver. I logged one station recently with a bizz-saw note which blotted out several 1930 notes.

Fellows, let's get together on this proposition and make a thorough clean up. Those who have no d.c. plate supply for a $7\frac{1}{2}$ -or 250-watter should sell those tubes and construct a rig using a 201-A with 200 volts "B" batteries to get a pure 1930 d.c. note. I have worked several hams using 201-A tubes with 135 volts on the plate and certainly must say they sound like crystal control. Every one I worked had a beautiful note — and the first cost and upkeep are low.

Let's get going and clean out the rotten notes.

— R. L. Toms, W5MH

A Suggestion for Handling Traffic

Ventura, Calif.

Editor, QST:

I am not a traffic man because my operating hours are not always reliable and I, therefore, cannot keep any skeds. Naturally I am mostly a rag chewer, but even so I QSP quite a few messages each month. There are many of us in the same boat, and at times it is rather hard to give QSP quickly when time is limited, especially when no schedules are kept.

I have tried directional CQ's without much luck, and yet I am sure there are lots of fellows who would be glad to exchange messages. Overcrowding of the bands is one reason, and a lot of needlessly long CQ's trying to get rid of traffic without the other fellow's knowing what's wanted make an awful lot of useless QRM.

To overcome this allow me to offer the following suggestions:

For rag chewers:

CQ CQ CQ de W . . . etc.

For traffic:

CQ CQ TFC de W . . . etc.

Will QSP and have outgoing traffic:

CQ CQ XTFC de W . . .

I believe this system would do away with a lot of needless QRM by letting the other fellow know just what is wanted.

Criticism is always welcome — let's have some.

— Roy R. Wallace, W6ERU

Another View of the DX Question

St. Louis, Mo.

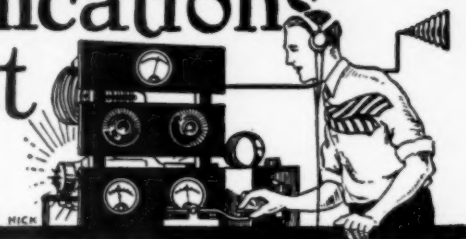
Editor, QST:

Upon going through some old issues of QST, I happened upon an article, "Don'ts for DX" which appeared in QST for June, 1929.

(Continued on page 68)

The Communications Department

F. E. Handy, Communications Manager
E. L. Battey, Asst. Coms. Mgr.
1711 Park St., Hartford, Conn.



Radio Division Checks Up Amateurs

Warning!!

Measure Your Frequency Daily

Take No Chances

Use Standard Frequency Transmissions

Build Suitable Frequency Meters

Check — and Double Check Frequency

FOR your information, we are pleased to advise that we have begun frequency measurements of amateur stations at our monitoring station at this office. We believe that other supervisors are doing the same, as we have a notice from the — District Office reporting the measurement of one of our amateur stations off frequency."

The quotation is from a Radio Supervisor's letter received in July. It indicates the inauguration of new measures by the U. S. government to definitely stamp out the evil presented by off-frequency amateur station operation. Frequencies will be measured with official government frequency standards and the Wouff-Hong welded impartially now and during the coming radio season. Examples will be made of those who do not watch frequency and "measure up." This is no sudden campaign of short duration, but the working out of a regular policy as now made possible by additional personnel and new equipment distributed throughout the Radio Division. The Radio Act gives the Division the responsibility and authority of safeguarding the interests of all services, keeping stations where they belong, policing the channels, taking action as necessary to prevent improper or illegal operation.

Perhaps one doesn't realize until the facts are brought home by bitter experience just how unpleasant and unfortunate it is to be placed in the position of having to give good and sufficient reason why licenses should not be recommended by the Radio Division for cancellation. Suitable equipment and "ordinary care" will enable any operator to keep his record with the Radio Division clean or clear from black marks. To avoid difficulty and steer clear of "jams" with the inspection service it behooves all amateurs to "watch frequencies" and make a regular practice of checking with a good frequency meter each time the set goes on the air — as has been recommended so many times in QST.

General Order No. 75 of the Federal Radio Commission is self-explanatory. It is given here in full as a matter of general information. It should be noted that failure to comply with a General Order of the Commission is equivalent to a violation of the Radio Act of 1927 and subjects the offender to the penalties prescribed under Section 32 of that Act.

— F. E. H.

GENERAL ORDER NO. 75

At a session of the Federal Radio Commission held at its office in Washington, D. C., on November 5, 1929.
IT IS ORDERED:

1. Every licensee operating a radio station under a license from the Federal Radio Commission who receives a notification from a Department of Commerce Supervisor or Inspector regarding any violation of the Federal Radio Commission or any violation of the terms and conditions of the station license, shall within three days of receipt of such notice send a written reply in triplicate to the Supervisor or Inspector from whom the notification was received.

2. The answer to each notice shall be complete in itself and shall not be abbreviated in the least by reference to any other communications or answers to previous notifications that the licensee may have received and answered.

3. If the notification relates to some violation that may be due to the physical or electrical characteristics of the transmitting

apparatus the answer to the Inspector shall state fully what steps if any are being taken to prevent future violations and if any new apparatus is to be installed the date such apparatus was ordered shall be given, the name of manufacturer and promised date of delivery.

4. If the notification of violation relates to some violation caused by lack of attention or improper operation of transmitter, the name and license number of operator in charge shall be given.

FEDERAL RADIO COMMISSION.

By (s) IRA E. ROBINSON,
Chairman.

Expeditions

A few changes and additions are in store for our list of "Finding the Expeditions" (see page 33, August, 1930, QST). We are informed that the call CVH has been assigned the Second Roumanian Arctic Expedition by the Roumanian government. The station in Greenland will be operating on 7350 kc. after August 15th.

The Dickey Orinoco Expedition now at Caicara, Venezuela, call DDOE, requests communication with amateurs on the 14-mc. band. DDOE uses low power on 15,000 and 8120 kc. The note is reported as "chirpy pure d.c." and best time for contact 3 p.m. E.S.T. W8BF was informed by OA4Z and OA4J that these stations have recently been in touch with the Dickey Expedition.

The yacht *Nomad*, last year assigned the call signal WHDC, will leave California on a world cruise about September 15th. The new frequencies and call signal will be announced in A.R.R.L. bulletins and broadcasts as soon as known. The *Nomad* will go direct to the Marquesas or Tahiti, from her berth at Waterhouse Landing, Long Beach, Calif. A great deal of amateur contact work is contemplated. An extremely detailed log of contacts and studies made on different high frequencies en route will be kept. A *Nomad* Expeditionary Relay is being planned to facilitate technical studies and communication by various expeditions from remote points. The A.R.R.L. and several foreign amateur societies will cooperate in the organization of this work.

Traffic Briefs

Commander Mathes, well known as KAICY, is now back in the States and has been obliged to resign his post as Section Communications Manager of the Philippines section. Upon his arrival in this country he was met at the boat by Colonel Foster, W6HM, through whom practically all our Mathes' QST reports had been transmitted. KAICY will be stationed at Bremerton Navy Yards, Seattle, Wash. John R. Schultz, KAIJR, will act as SCM for the Philippines.

Caution! Remember that a second harmonic of a station on 7200 kc. falls on 14,440 kc., or outside of the 14 mc. amateur band. The second harmonic of any frequency in the 3500 kc. band above 3650 kc. will fall outside of the 7000 kc. band. WEG at about 7418 kc. can be mistaken for WEM (7400 kc.); WKP at 6950 kc. can be mistaken for WIZ at 6965 kc.

WSCMP's new 1999 r.f. chokes are so good that one has to keep a package of cough drops near the transmitter when using them.

We recently received a letter from W4SK telling us about his cooperation with the U. S. Coast and Geodetic Survey

while they were sounding the east coast of Florida. W4SK contacted WSQ, the U.S.S. *Lydonia* of the Survey, and learned that a shore party was due to arrive at Melbourne, Fla., to erect towers along the coast and take observations. W4SK offered to handle communications between the ship and the shore party. Many important messages were handled to and from the *Lydonia*. Formerly these messages had to be mailed to Jacksonville where the ship called every two weeks for mail. By means of amateur radio, observations and all other data reached the *Lydonia* the same day as compiled. During a high wind several "100 footers" on shore were blown down. A message was quickly handled relative to rebuilding these towers, and supplies were ordered by amateur radio. Landing data, shore parties, weather data plans and concluding data were all handled by W4SK. The distance between WSQ and W4SK varied from one half a mile to 180 miles, and reliable communication was had at all times. WSQ worked on 3500 kc. and W4SK on 700 kc. making perfect break-in possible. Some two or three hundred messages were handled during the two months of their schedules. Well done, W4SK.

Beginning amateurs in the vicinity of Toledo, Ohio, are reminded that a class in code practice meets at the Toledo Amateur Radio Club, 1700-07 Sylvania Ave., every Monday evening at 8:00 o'clock. Anyone interested in learning the code is invited to attend.

WSDCG says, "A good fist means as much to radio communication as good penmanship means to business." More, OM, MORE!



Strike three! You're out! Willis Hudlin (above), star pitcher of the Cleveland team, American League, also does some batting — he is the owner and operator of W8BGS and bats out a nice signal at various times when he is "resting his arm." Any hams who have a lexing toward baseball should get QSO W8BGS and get some pointers!

W2ACD is very pleased to announce that in the future he will be on the air with his phone during quiet hours. The two BCLs with whom he had trouble have recently passed on to other worlds. W2ACD denies that any outside help was summoned to bring about this happy solution to his interference problem.

VK6NK is the portable call of VK2NO and is being operated in the British District of N. W. Australia. Due to the nature of the country VK6NK is located in, some interesting QSOs may be had.

WSARP reports hearing Senior Marconi's yacht located off the coast of Italy on April 30th at 5:15 in the afternoon. A test was being conducted with 'phone on 6100 kc. and WSARP says the voices were heard very plainly. FB, OM.

We wonder how many YLs own and operate amateur radio stations. We know of the following YLs and XYLs: W1AJC, W1AAV, W1AIG, W1AJJ, W1KY, W1OS, W1ZR,

W2BY, W2MZ, W3AKB, W3CDQ, W6ALH, W6ETA, W6EVA, W7AHJ, W7ALZ, W8ANY, W8CNO, W9BKL, W9EIW, W9FBF, W9GJX, VK3HM, G6YL and PY7AB. Know of any others?

Here's a nice bit of relaying: W7BB received a message from KA1CY in Manila, 'phoned it long distance to Bremerton, Wash., and had a reply back at KA1CY within five minutes.

W9UM finds Dennison's No. 12 index tabs very FB in fixing up his log book for quick reference. These are applied to the leaves of the call book at the different districts, and through the foreign stations in groups A-B, C-D, E-G, etc. Markers may also be placed at the "Q" signals, and other important references. Starting at the top of the page with the first district and placing each additional tab a bit farther down, none of the markers will be hidden behind the others. This arrangement is very convenient when you wish to find the QRA of a station in a hurry.

We received a clipping from the *Hongkong Telegraph* the other day which makes us, as members of the A.R.R.L., throw out our chests just a little abnormally. The clipping refers to a dinner which was tendered Commander Mathes, KA1CY, by Hongkong amateurs during his visit to China in April. Among other things reported is the fact that "Toasts were given to His Majesty the King, the President of the United States and the American Radio Relay League." Ahem!

The members of the Pioneer Radio Club of New Rochelle, N. Y., were given a real treat at a recent meeting when Mr. J. H. Durrell, one of the passengers on the *Graf Zeppelin* during its last flight, gave a complete description of his tour around South America by air. He described how the *Zepp* depended on radio for weather information.

Harold T. Mapes of Bridgeport, Conn., is making a tour of the United States and has his portable outfit, W1ZZA, along for amateur contact. Listen for him on 7000 kc.

The operators at W1AXV are reported to be the first in the United States to pick up the 33-meter signals from the "Southern Cross" during the transatlantic flight of that plane. When received at W1AXV at 7:10 p.m. E.D.S.T., June 24th, the plane was about 400 miles east of Newfoundland. Practically everything that was sent from the plane from that time until they landed at Harbor Grace, N. F., was also copied. The next day the plane was followed all the way from Newfoundland until they had passed Boston. Joseph A. Staubs of Newark, N. J., also reports hearing the "Southern Cross," and says that the call letters were VMZAB.

W6OJ was recently QSO an "under-cover" ham on a ship at Guantanamo, Cuba. This ham hadn't seen his family in Los Angeles for two years. W6OJ got his wife on the 'phone and to her delight carried on a second-hand conversation for one hour. Later rag chewing developed the fact that W6OJ and this fellow had once been on a cruise together aboard the U.S.S. *Maryland*. It's a small world after all.

On April 19th, W9FNK, Rochester, Minn., was heard in New Zealand on 3500 kc. while using one type '10 with 550 volts on the plate in the single control transmitter described in December, 1929, QST. FB, OB.

Speaking of low power, VE5AW at Whitehorse, Yukon, reports a fine QSO on March 11th with OZ71M on 14 mc. when OZ71M was using only 90 volts on the plate with as input of 3.75 watts. OZ71M's signals were R3, and steady as crystal at VE5AW.

Amateur radio played its part in the Boy Scout Exhibit held in Poughkeepsie, N. Y., early this year. W2BWG installed his station in the booth at the exhibit by special permission of the Radio Supervisor. Three other Poughkeepsie amateurs, W2ANI, W2BWS and W2AHR assisted W2BWG in his work. A demonstration of the workings of amateur radio was given and many messages were handled for those attending the exhibit. Among the messages sent was one to President Hoover from the local scouts on the occasion of the twentieth anniversary of scouting. This message was relayed through W3AEX, Washington, who

delivered it to the White House. The Scouts also sent a message to James E. West, National Scout Head in New York City. W2BWG used the CW-Phone transmitter described in September, 1929, QST.

WSDPI, in talking about long-winded CQ hounds, says: "It's no good to CQ until you get all the fellows answering you and then only work one. The gang soon learns that it will do no good to answer your CQs, and your percentage of stations worked goes down." Did you ever think of it that way?

It has been observed that some amateurs use their call letters in a number of different locations, thus making them serve the purpose of a portable license. It must be remembered that an amateur station license is valid only at the location specified on the license. If you travel around a great deal and wish to take your transmitter with you, you must obtain another license — a portable license. Never use your regular call at any other address than that indicated on your license.

Operating at W1MK has its trials and tribulations. "RP" tells us of one evening when he received a telephone call from a musician (?) who wanted to "play his cornet over our radio station." The American Radio Relay League is listed under "Radio Broadcasting Stations" in the Hartford telephone directory, so we may expect any number of offers from down and out radio artists from now on.

Early this year the Fourth and Sixth District 'phone men held a QSO party on the 3500 kc. 'phone band. The party was held between 4 and 6 a.m. C.S.T. on two mornings. W400 worked W6CRK and W6BAN. W4QZ worked W6BIU. W4IA also worked W6BIU, W6CNE and W6BJQ. W6BIU and W6BJQ were worked at 6:10 a.m., broad daylight at W4IA, and signals were R6 at both ends. This surely represents some fine 'phone work. FB, OMs.

K4KD reports that he has been receiving a number of QSL cards for K4 stations that are not listed in the latest official list from the Radio Supervisor. He goes on to advise that "Amateurs working any other stations using a 'K4' call should get the full QRA at the time of QSO, and in particular, look for the call under the U. S. Fourth District list, and if same appears as assigned to a 'W4,' they should ask the station for an explanation." Let's try to catch some of these bandits, fellows.

W3AFF suggests the following as a means to help the BCLs and at the same time originate some traffic. He says that almost every night some broadcasting station puts on a special program and asks for reports and request numbers. He suggests that BCLs hearing a station and wishing to request a special selection or report reception file their messages with amateurs, and that amateurs in or near the city where the broadcasting station is located get on the air and handle these requests. This looks like a chance to show the BCLs what amateur radio can do, and given a little push we believe the idea would soon work up considerable impetus. Be careful, however, to steer clear of the "rubber stamp" variety of messages.

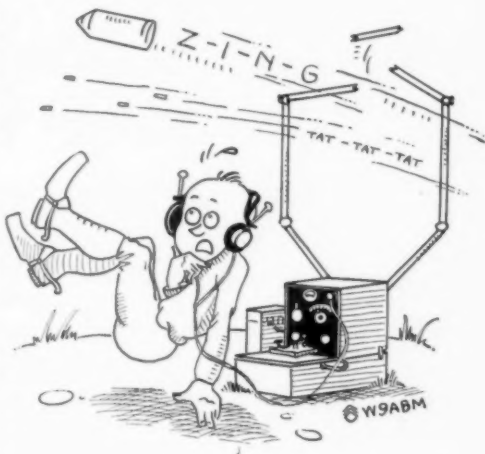
What is believed to be the first International Chess Match by amateur radio was recently held over W6LN and LU3FA. The match was held between four members of the Los Angeles Chess and Checker Club and players of the Gimnasia y Esgrima Chess Club of Rosario, Argentina. Both W6LN and LU3FA operated on 14 mc. A total of four sessions was held, the duration of the longest being six hours — that was surely a record DX QSO. The four sessions totalled about eighteen hours. Each session started at 4 p.m. PST with W6LN at the key. He was relieved when he left for work at 6:30 by W6VH and others. The Los Angeles team won the match. Good work, W6LN, LU3FA and others.

The correct address for NN1NIC is Communication Officer, Observation Squadrons, 2nd Brigade, U. S. Marine Corps, Managua, Nicaragua. Cards for NN stations whose QRA is unknown may be sent care of the Brigade Signal Officer, 2nd Brigade Marines, Managua, Nicaragua.

Ham Work With the Artillery

By N. C. Lippincott, W9FVB-W9DLQ

The local artillery unit of the Wisconsin National Guard had approached me several times with requests that I join their unit as a radio operator, so this summer, there being not so much doing at home, I decided to give it a trial. Accordingly on the 4th of July we started for the hills and



sand country of western Wisconsin for the two-weeks' training trip. Camp McCoy is most advantageously situated for the work of the artillery, there being about 14,000 acres or more of sandy hills and swamps.

The low swampy portion is completely surrounded by hills, making it possible to place guns on the hills on one side and observe the shells as they light, from the best points. Observers are stationed at a place more or less removed from the guns. It is necessary to have communication between the observers and the gun crews, and here is where the hams came in for their share of the sport. Yes it was really sport in spite of the fact that it was often necessary to lie on the ground in the bright sunlight for hours at a time.

The work carried on was so interesting that the small discomfort of heat was scarcely noticed. As the shells exploded the men of the observing party watched through instruments that measured the deviation from the target and then computed corrections to be sent back to the gun crews.

It was the pleasure of the writer to be at both the sending and receiving end of these contacts at different times. It can be said without boasting that the radio equalled if not surpassed the regular telephone in maintaining reliable and very accurate service between widely separated points.

The messages handled consisted of orders and directions in plain language, and code messages that were a puzzle of letters, figures and signs best understood by the gun crews. (The observers had many lengthy discussions as to the proper code word to use. Hi.)

Everything considered, I got as much kick out of the experience as I did when I worked my first foreign DX. And it was quite an experience. The receiving operator has to take his set right up behind the guns. That means plenty when the guns are of the "seven-inch" variety which shoot a hundred pound shell ten miles.

The field radio stations could be transported by two men and appeared much as sketched by W9ABM. Three tubes did all the work, 120 volts being applied to the detector tube for limited-range transmitting. Army calls and a frequency of about 4350 kc. was used. The results obtained under all conditions were highly pleasing. On one occasion two-way contact was maintained over a distance of seven miles with perfect reception at both ends. At another time the set was operated in a steel-lined dugout with as good success as out in the open field.

The success of these operations was due to the concerted efforts of W8TG, W9ZE, W9ABM, W9FII and yours truly

who answers the call of W9FVB in the summer and W9DLQ in the winter. To the hams and would-be hams who assisted, we offer sincere thanks.

BRASS POUNDERS' LEAGUE

Call	Orig.	Del.	Rel.	Total
K6EWB	181	64	1230	1475
W6QP	174	169	963	1306
W6CF	14	1	1020	1035
KAIHR	304	121	446	871
W6ALX	42	125	338	505
W1MK	56	146	260	462
K6DV	314	2	56	372
W1CMZ	30	27	230	287
W2QU	120	164	—	284
W5DYH	34	33	205	272
W6AVJ	252	8	12	272
W6DEP	38	12	220	270
W3BWT	72	59	131	262
W6ALU	9	12	236	257
YE2AC	231	13	8	252
W38M	26	67	152	245
W481	40	83	120	243
W6EGH	61	181	—	242
K6ACR	153	52	22	227
W6CDS	75	95	114	214
W8AJC	72	27	113	212
W6ETJ	18	22	164	204
W6AXV	183	8	11	202
W4JH	100	20	81	201
W6BEB	30	50	100	180
W7ALM	54	103	20	177
W3FJ	68	74	26	168
W9DZM	78	53	37	168
W6WA	45	101	16	162
W3AVT	50	51	—	131
W9DRG	61	53	4	118
W6CBW	2	52	41	95
W6DPO	—	51	14	65

All these stations appearing in the Brass Pounders' League are noted for their consistent schedule-keeping and dependable message-handling work in amateur radio. Special credit should be given to the following stations in the order listed responsible for over one hundred deliveries in the message month: W6EGH, W6QP, W2QU, W1MK, W6ALX, KAIHR, W7ALM, W6WA.

Deliveries count! A total of 200 or more bona fide messages handled and counted in accordance with A.R.R.L. practice, or just 50 or more deliveries will put you in line for a place in the B.P.L. Why not make more schedules with the reliable stations you hear and take steps to handle the traffic that will qualify you for B.P.L. membership also?

W9DQN's total of 307 listed in July QST was erroneously credited to W8DQN.

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below: (The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the present incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in Hartford on or before noon of the dates specified, all of which are 1930.

Section	Closing Date	Present SCM	Present Term of Office Ends
Alaska	Sept. 15, 1930	W. B. Wilson	Mar. 28, 1930
Utah-Wyoming	Sept. 15, 1930	F. N. James (resigned)	.....
Vermont	Sept. 15, 1930	C. Paulette	July 28, 1930
Mississippi	Sept. 15, 1930	J. W. Gullett	July 28, 1930
Arkansas	Aug. 15, 1930	H. E. Vette	Aug. 28, 1930
Kentucky	Aug. 15, 1930	J. B. Wathen	Sept. 8, 1930
Maritime*	Aug. 15, 1930	.....	.....
Idaho	Sept. 15, 1930	James L. Young	Oct. 2, 1930
Colorado	Oct. 15, 1930	C. R. Stedman	Oct. 20, 1930
Ontario*	Oct. 15, 1930	E. C. Thompson	Oct. 20, 1930
Northern	.....	.....	.....
Minnesota	Oct. 15, 1930	Carl L. Jabs	Oct. 20, 1930
Rhode Island	Oct. 15, 1930	Chas. N. Kraus	Oct. 31, 1930
San Francisco	Nov. 15, 1930	C. F. Bane	Dec. 20, 1930

Due to the resignation in the Utah-Wyoming Section, nominating petitions are hereby solicited for the office of Section Communications Manager in this Section and the closing date for receipt of nominations at A.R.R.L. Headquarters is herewith specified as noon, Sept. 15, 1930. Reports from ORS in these sections should be sent to the Acting SCM listed on page 5 of QST.

*In Canadian Sections nominating petitions for Section Manager must be addressed to Canadian General Manager, Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

To all A.R.R.L. Members residing in the Sections listed:

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager, for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of By-laws, 5, 6, 7, and 8.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League who holds an O.R.S. appointment in their Section as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, A.R.R.L.
1711 Park St., Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the Section of the Division hereby nominate as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of A.R.R.L. members are required.)

The candidate and five or more signers must be League members in good standing or the petition will be thrown out as invalid. The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit on the number of petitions that may be filed, but no member shall sign more than one such petition.

4. Members are urged to take initiative immediately, filing petitions for the officials for each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

— F. E. Handy, Communications Manager.

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections on or before the closing dates that had been announced for receipt of such petitions. As provided by our Constitution and By-laws, when but one candidate is named in one or more valid nominating petitions, this candidate shall be declared elected. Accordingly, election certificates have been mailed to the following officials, the term of office starting on the date given.

Western Pa.	Robert Lloyd, W5CFR	July 1, 1930
Western	.....	.....
Mass.	Leo R. Peloquin, W1JV	July 1, 1930
Santa Clara	Frank J. Quemont, W6NX	July 1, 1930
Valley	.....	.....
New Hamp-	Vernon W. Dodge, W1ATJ	July 1, 1930
shire	L. B. Lazure, W9RH	July 1, 1930
Missouri	Arthur G. Wester, W2WR	July 12, 1930
Northern N.J.	Howard Cushman, W9DNS	July 12, 1930
South Dakota	.....	.....
North	.....	.....
Carolina	H. L. Caveness, W4DW	July 15, 1930
Indiana	George Graue, W9BKJ	July 15, 1930
N. Y. C. and	.....	.....
L. I.	Vincent T. Kenney, W2BGO	July 15, 1930
Kansas	John Amis, W6CET	July 28, 1930
Iowa	H. W. Kerr	July 28, 1930
Southern	.....	.....
Texas	H. C. Sherrod, Jr., W5ZG	July 28, 1930
Ohio	Harry A. Tummonds, W8BAH	July 28, 1930

In the Illinois Section of the Central Division, Fred J. Hinds, W9APY, Eugene A. Hubbell, W9ERU, and Larry A. Wagner, W9DJD, were nominated. Mr. Hinds received 141 votes, Mr. Hubbell 22 votes, and Mr. Wagner 18 votes. Mr. Hinds' term of office began July 1, 1930.

In the Nebraska Section of the Midwest Division, Samuel C. Wallace, W9FAM and Gordon I. Henry, W9DPR, were nominated. Mr. Wallace received 29 votes and Mr. Henry 15 votes. Mr. Wallace's term of office began July 1, 1930.

In the Michigan Section of the Central Division, Kenneth Conroy W8DYH, and Ralph O. Williams, W8AJC, were nominated. Mr. Conroy received 89 votes and Mr. Williams 29 votes. Mr. Conroy's term of office began July 31, 1930.

In the Virginia Section of the Roanoke Division, J. F. Wohlford, W3CA, and John Carl Morgan, W3KU, were nominated. Mr. Wohlford received 25 votes and Mr. Morgan 11 votes. Mr. Wohlford's term of office began July 31, 1930.

Traffic Summaries

(JUNE-JULY)

Pacific led by Los Angeles	9608
Central led by Michigan	1973
New England led by Eastern Massachusetts	1450
Atlantic led by Maryland-Delaware-District of Columbia	1201
Hudson led by Eastern New York	745
Roanoke led by Virginia	571
West Gulf led by Southern Texas	566
Southeastern led by Georgia-South Carolina-Cuba-Isla de Pines	563
Northwestern led by Washington	559
Dakota led by Southern Minnesota	447
Quebec	439
Midwest led by Missouri	375
Rocky Mountain led by Utah-Wyoming	315
Delta led by Arkansas	190

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190

R, 1930

Ontario 44
Vanalta led by British Columbia 38
Prairie led by Saskatchewan 2
446 stations originated 5151; delivered 3679; relayed
10,256; total 19,086. (71.5% del.)



The Los Angeles section certainly deserves a hearty "pat on the back" for leading the country so consistently. Once more they get the Traffic Banner, and this time with a total of 4453! Their figures are mounting instead of dropping gang. It's time they were given some competition. Wha, section will challenge Los Angeles and carry the Bannet next month?

Official Broadcasting Stations

CHANGES AND ADDITIONS

W9ECI (7140 kc.) Mon., Wed., Sat., 10:00 p.m. C.S.T.;
Wed., Sun. mornings, 9:00 a.m. C.S.T.
K6DV (7100 kc.) Tues., Thurs., Sat., 9:00 p.m. H.S.T.;
Sun., 1:00 p.m., H.S.T.

W1MK

A.R.R.L. Headquarters' Station W1MK operates on frequencies of 3575 kc. and 7150 kc. Robert B. Parmenter, "RP," is the chief operator; his fist is familiar to most of the amateur fraternity. Occasionally other members of the Headquarters' staff operate at W1MK. Their personal signs may be found in the QRA Section of QST.

Throughout the following schedules Eastern Standard Time will be used.

OFFICIAL AND SPECIAL BROADCASTS are sent simultaneously on 3575 kc. and 7150 kc. at the following times:

8:00 p.m.: Sun., Mon., Tues., Thurs., and Fri.

10:00 p.m.: Mon. and Fri.

12:00 p.m. (midnight): Sun., Tues., and Thurs.

GENERAL OPERATION periods have been arranged to allow every one a chance to communicate with A.R.R.L. Headquarters. These general periods have been arranged so that they usually follow an official broadcast. They are listed under the two headings of 3500 kc. and 7000 kc. to indicate whether the watch is devoted to listening on the 80-meter band or to the 40-meter band.

3500 kc.

8:10 p.m. to 9:00 p.m. on Sun., Mon., Tues., Thurs., and Fri.

10:00 p.m. to 11:00 p.m. on Tues. and Thurs. (No OBC sent before these periods.)

12:00 p.m. to 1:00 a.m. (or later) on Sunday night (Monday morning).

7000 kc.

10:10 p.m. to 11:00 p.m. on Sun., Mon., and Fri.

12:00 p.m. to 1:00 a.m. on the following nights (actually on the morning of the day following): Mon., Tues., Thurs., and Fri. (Only on Tues., and Thurs. does the OBC precede these periods.)

SCHEDULES are kept with the following stations through any of which traffic will travel expediently to A.R.R.L. Headquarters, on 3500 kc.: W1ACH, W1APK, W1BXB, W1CTI, W1ZB, W2JF, W3AVI, W3BWT, W3CBT, W9OX, VE2AC; on 7000 kc.: W6CIS, W6DEP and W6OJ. QSL CARDS for W1MK should be addressed in care of A.R.R.L., 1711 Park St., Hartford, Conn. A complete log of every transmission is made and W1MK is always glad to send any station worked a card, but frequently cards are lost when sent direct to the station at Brainard Field.

Traffic Briefs

W5BAD would rather repeat a message a hundred times than have a fellow "OK" it even though incomplete, and then not deliver it. Check and double check!

Since W9CKQ started his schedule with VK5HG he has received many requests to forward messages to Australia. He states that regulations governing operation of all Australian amateur stations specifically prohibit the handling of

messages to and from private individuals. The traffic handled through W9CKQ and VK5HG for the Magnetic Observatory, VK6MO, is handled by special permission of the Radio Inspector. This special permission allows only the handling of traffic to and from the Observatory.

CHAMPION AMATEURS

I dashed into the golf shop of the Augusta Country Club late in the forenoon of March 31st. Somewhere on the links Bobby Jones was showing the boys the ways of the amateur. The Southeastern Open Golf Tournament at Augusta, Ga., was under way. On the desk on one side of the shop stood a high-frequency receiver with loudspeaker. Montgomery Harrison, W4DV, was handling the dials. While he is a radio bug, he is also a golf enthusiast and I wondered why he was not trailing the immortal "Bobby." I had no time to ask questions for at this moment the loudspeaker came into action:

"This is station W4PAD with W4AFQ at the mike, talking to W4DV. I have some scores for you."

Information came readily enough from W4DV. A transmitter was located on the tenth tee and the scores were being sent in from there by amateur radio. It was a Hartley oscillator, using loop modulation with 360 volts of "B" battery on the plate of a Type '10. Six volts from the storage battery of the Ford, which housed the entire apparatus was used to light the filament. The antenna and counterpoise were strung from trees to the car. Scores were caught downtown, six miles from the tee without trouble on the 3500 kc. 'phone band.

The operator of W4PAD was one of the most enthusiastic amateurs of the Augusta crowd, Linwood Sikes, W4AFQ. W4PAD was the portable station belonging to W4AAY, also of Augusta. All the Augusta amateurs had cooperated to make the affair a success.

Associated Press correspondents were enthusiastic over the success of the plan. Scores were obtained and put on the wires an hour sooner than had been the case in any other major golf tournament in this country.

And just to show that it was an "amateur" affair, the great Bobby Jones finished the four rounds in two strokes under par figures and some thirteen strokes ahead of his nearest competitor.

— Elmer I. Ransom, W4QQ

W6BRO kept a daily schedule with IPH, the portable station of the Automobile Club of Southern California's expedition to Mexico and Central America, which was engaged in exploring and mapping jungle to aid in planning an International Pacific Highway from Vancouver, B. C., to South America. W6EQF was the operator on the expedition. W6BRO handled many messages and several thousand words on press from IPH.

W8CMP knows his arithmetic. He called a 3 x 3 CQ and got an answer from the net. The next time he stuttered and got an eight!

W6DKV in California recently received some birthday gifts from Utah and wished to send thanks. On the very day the gifts were received he worked W6EKF, who is in the town they were sent from. W6EKF extended his thanks via telephone and had an answer back to W6DKV in less than five minutes. That's putting amateur radio to real use! FB!

We are still getting complaints of the very uncommendable conduct of a large number of hams, especially in the 7000-kc. band, who as W3EC puts it "don't deserve the name 'ham'." It is the old story of answering a CQ and having the fellow come back: "GE OB UR — SIGS QSA — SURE PSED TO WRK U OB QRU HR SURE HPE CU AGN OB VY 73 ES GD LUCK VA DE W — VA GN." Just what credit to amateur radio is a fellow who will treat a brother ham like that? Invariably when this class of 'ham' is asked to QSP, his transmitter suddenly goes floey or QRM gets unbearable so that he comes back: "Sorri ND VA". We wonder how these fellows can boast membership in the A.R.R.L. without having a guilty conscience! Snap out of it, gang!

SCHEDULE WORK

What a wonderful feeling it is to call a station at a certain time and hear him come right back at you "ready for business." You fellows who don't keep schedules will never

know the feeling of satisfaction when working a station night after night "on sked." To know that when you call, someone is at the other end waiting for you — Boy! isn't that accomplishment? You bet it is! And you fellows who haven't experienced the pleasure of schedule work should get started and get in on this part of the "fun in amateur radio."

W6DZY is an excellent outlet for DX traffic. He can QSP direct to Alaska, England, France, Panama Canal, South America and Hawaiian Islands.

DX schedules seem to be netting a number of the gang "parrots" FQPM brought W4OC one from Africa and nncAB has promised W9BCA one when he comes north soon on vacation. From what we know about parrots these boys will have to watch their language from now on. Hi.

Members of the Naval Communication Reserve in the Twelfth Naval District have made an effort to get as many two-letter "N" amateur calls as practicable and the following calls belong to reserve members in that district: W6NB, W6NC, W6ND, W6NJ, W6NM, W6NK, W6NU, W6NV, W6NX and W6NZ

An American Army officer, recently returned from China, reported to W6EPF that the amateur traffic circuit, W6EPF-W6EEO-K1HR-ACSAG, between San Diego and Shanghai was consistently faster and more accurate than either the Navy or Commercial services. This is excellent proof of the real value of amateur radio. FB, OMs!

W9DQN sends us a little dope on the Russian Polar Shore Station, RPX, at Hooker Island, Franz Josef Land, which he worked recently for one hour and ten minutes. RPX uses an oil motor that takes about two minutes to start and stop. His frequency is 7200 kc. and his tone is ICW.

Useless Efficiency?

By Harold J. Sullivan, W1AAD

AFTER listening to some of the stations that pride themselves on 1930 performance, some further comment in QST may not be out of place. These stations are careful, in sending a CQ, to make it brief and to interrupt it frequently with their call signal. That's the result of constant hammering on the part of QST and its contributors. Fine! The art progresseth!! Aber, was ist das? But why economize on one thing and waste twice as much time on another? I cordially invite you to don the cans and listen to one of these stations answer a CQ. I have gone to sleep waiting for them to sign — and I'm used to late hours, too.

I can recall one case in particular. A friend of mine, in an irrational moment, was rash enough to inform me that his was the superior station. He stood ready to prove it and we finally agreed on a DX contest, each station to work the same number of hours, the operator working the greater number of distant stations to receive a prize to be supplied by the loser. The contest was on. After hearing a CQ from my friend, I tuned around to see what success he would have, if any. His CQ, by the way, was up to requirements. In regard to my friend's success, he had much too much during the contest. In reply to his CQ, however, an answering signal was heard, weak, but very steady nice d.c. I proceeded to time the reply. It was three minutes and forty-one seconds later that the world was enlightened! To make matters worse, the station was only about two hundred miles away.

This operator, to whom I have reference, cannot offer the excuse that he is a beginner. He is one of the old timers and a very good operator in practically every other way. Yet this one fault stamps him, in my mind at least, as still back in the days of the rotary spark gap. There are plenty of others who indulge in this goat-getting pastime. Many other instances were noted during our contest. The theory is that if you call a station long enough, you'll get it. Along with the other things you will and should get at the same time, is a long-needed reprimand on operating without breaking the call to sign and listen, but you will often get the go-by altogether by intelligent operators. Stations in calling should send the call three or four times, sign once or twice and start over

again. Using break-in or at least interrupting the call frequently to listen for reply is recommended.

Some of my friends may wonder where I get the "crust" to "pan" a fellow amateur. I can only say in my own defense that I try to operate in a 1930 (A.D.) manner and that I do not use a long calling system.

A Shake Up

By Howard C. Storck, W8BYN*

EVERY so often after a let up on raving about poor operating the gang falls into a slump and some of the "stuff" we hear on the air gets deplorable. Then is the time to again rally forth with some "bare facts" regarding operating as it truly exists. I feel such a time has arrived and I want to herewith express my feelings about things I hear on the air today.

This is going to be straight-from-the-shoulder talk and should jolt some of you wider awake than you usually are when pounding brass. It will undoubtedly be skidded around the detours by the very hard-shelled hams I am trying to reach, but if it should penetrate beneath the armor plate of just one of them, I will consider the time well spent, and not altogether wasted.

First let us consider testing and QSYing. Both are necessary at times, but there is a time and place for everything and the crowded hours are most emphatically NOT the time, regardless of the place. The moral of this is: Buy, beg or borrow a frequency meter, find some frequency and stick to it, unless, of course, you have to QSY a little to shed some QRM while working a station. And then, always have a point above and below your regular frequency to retreat to in case of said QRM. This may sound like a lot of bunk to some of you dial-twisters, but try it! Get yourself known as sticking somewhere close to a certain frequency and watch the number of contacts grow.

The above mention of QRM brings to mind the persistent users of modulated signals — those utterly selfish individuals who use ICW because . . . well, I can think of only two reasons. Either they are so selfish that they care not what QRM they cause in their effort to splash the ether hard enough to get an answer to every call, or else they do it for the love of doing the wrong thing, just like a spoiled child. The complaints about ICW are many. Even the worst of the ham fraternity, no matter what their sins, complain about ICW interference. There is only ONE way to stop it — NEVER WORK A STATION USING ICW! The sooner this boycott is put into effect, the sooner the fiends who persist in using that devilish sort of modulation will be forced to resort to some other plate supply and the air will be cleared of this menace, at least. There may be an excuse for a poor note but there is absolutely no excuse under the sun for ICW!!

Now, since the number is still quite large, let us consider the "CQ Hound." If there is anything more conducive to thoughts of murder, arson, mayhem or what have you than the professional CQ hound, I do not know what it is. Do you realize how many stations, good, bad or indifferent tune away after listening to about the fiftieth CQ? Do you realize that, though you may get an answer, it is probably someone who tuned in on the very last of the long, drawn out, wailing CQ and did not have to suffer the agony of waiting for the end? And isn't it usually the case that these professional CQ hounds are just the boys who either haven't a good enough set to hear the answers or else lack the ability of picking them up and start the old sing-song right over again a few seconds after signing off? Just as soon as the CQ hounds realize the time and power they are wasting they will try a normal CQ and find that they get many more contacts, and the rest of us will heave a sigh of relief and cross that evil off the list.

Equally as bad as the CQ hound is the man who sends his call too infrequently. Still worse is the ham who only knows how to send CQ and cannot send his own call distinctly enough to be copied. And as for those with the rhythmic awing, who make . . . out of CQ, they should either be exterminated or a collection taken up to furnish them with drums.

Before I close my tirade I must speak of the CW men who persist in operating in the 'phone band. There are but very few of you but no one listens for CW up there and it

* SCM of Ohio.

only causes the ire of the 'phone men to fall down upon you. On the other hand, I must tell the 'phone men that it seems very unfair to the men handling traffic to have them crowd down into the CW band and QRM operations. Let's cooperate!

Lastly, the outlaw key-pusher, who works on frequencies unassigned to amateurs, should, in my estimation, be pushed off the earth, to percolate somewhere in the upper realms, on Mars or Venus, or if it were not a wicked thought they might find a more suitable abode in the nethermost depths of the final resting place of all bad little hams.

And now, having probably incurred the enmity of all the transgressors of ham radio laws above mentioned, I will close my expressions of disgust with a heart-felt prayer that at least one man has been reformed and my efforts have not been in vain. But henceforth I shall sleep with my trusty shotgun always handy, and have already hired a small army for protection through the day. Hi.

Traffic Briefs

W5GF thinks that some radio amateurs need better maps. The other day a message, originated in Brooklyn, N. Y., and destined for New Hampshire, was offered to him by a station in Indiana!!

Amateurs touring the eastern part of the United States will be interested in knowing that our good friend W8EA has made an arrangement whereby the Dimeling Hotel of Clearfield, Pa., will make a discount of 10% on lodging for all A.R.R.L. members, upon seeing their membership certificates.

W2AXX of Castleton, N. Y., recently wrote up a full page of descriptive and illustrative material on a number of Albany, N. Y., stations. The account appeared in the *Knickerbocker Press* of Albany. We see many accounts of this sort from time to time, some of them small, and some of them large. Whatever their size, we always feel that the amateur who did the good work deserves the thanks and commendation of his fellows. FB, W2AXX, and others!!

The important thing in all our U. S. A. message handling work is to be careful always to preserve that most treasured possession, our amateur status. No tolls must be collected and no compensation either direct or indirect involved for handling messages or demonstrating our stations or their equipment — for an amateur is defined in international and national law as an individual interested in the radio art, but without any pecuniary interest therein. Don't let any commercial interest use you or your station, or misuse amateur radio through these means, or you may find yourself without an amateur standing and without an amateur license for your station.

There are at least two kinds of Canadian traffic that U. S. hams may handle. First of all there are the messages which "by reason of their unimportance would not warrant recourse to the public telegraph services." Such messages as provided in the International Radiotelegraph Convention may be relayed freely (and handled by amateurs internationally, except where the government of certain countries has filed objection to the exchange of even such communications, where this becomes illegal for both the stations concerned). Then there are the messages which U. S. hams may receive from Canadian stations or expeditions at remote or isolated points. These may be accepted regardless of importance provided they are handled as treaty between the government of the United States and Canada. Such messages, also messages received in cases of emergency, must be forwarded to destination, not by amateur radio, but by transmittal to the nearest office of a wire telegraph company for further handling.

In the final analysis there is no way for an amateur to draw the line in cases where messages are filed for foreign countries and it becomes necessary to decide if the traffic is such as would "warrant recourse to the public telegraph services." Of course every message, greeting or otherwise, is of interest and value to someone or it would not have been sent. Only the party originating a message is qualified to judge whether that message is of sufficient interest to warrant recourse to a commercial communications company

where there is actually responsibility assumed for delivery of the message.

It is suggested that wherever traffic is filed at an amateur station for transmission internationally (where no special privileges are in force by treaty arrangements, and where no objections have been filed prohibiting the handling of experimental communications) that the originating station oblige the folks desiring messages filed to assume the responsibility which is properly theirs in deciding whether the message is important or not. Have the originator sign a statement on the reverse of the message blank as to whether or not the particular traffic being filed is such as would (or would not) warrant recourse to commercial telegraph or cable facilities. Such a statement will enable the amateur operator to decide whether the traffic can properly be accepted for origination through his amateur station and will constitute grounds for protecting the amateur concerned if any question arises that makes reference to the message file necessary in the future.

At present many of the European governments are not permitting their amateur stations to handle messages "for third parties" and this regardless of whether or not the messages would warrant recourse to wire or cable if not accepted by amateur radio. In spite of the wording of the International Convention, these European amateurs are limited to handling only "station to station" experimental messages. We see not the slightest objection that could be offered and believe that these stations ought to be permitted to handle any messages for third parties just as we can in this country, except that of course in considering exchange of messages between nations the international law is designed to protect the government owned cables so that the messages would have to be classified as suggested in our paragraphs just above before they could be transmitted. It is hoped that European governments may modify their views on "third party" amateur communications when their representatives get together again.

The Mohawk Valley Brass Pounders, Utica, N. Y., held their fourth annual banquet on April 5th, with eighty in attendance. The affair included a good feed, speakers, installation of new officers and contests. The principal speaker was M. L. Prescott of General Electric. The following cities were represented: Rochester, Auburn, Syracuse, Albany, Schenectady and Pittsfield, Mass. It was a most successful meeting with plenty of "ham spirit," and as the saying goes, "A good time was had by all."

"Please rush 100 canisters for All-Service masks to explosion at Kettle Island, Kentucky. Needed at once." This was the nature of the message sent by W9CEK to W8DDG at the time of the Kettle Island mine disaster when sixteen men were entombed following an explosion. The canisters were needed immediately by the rescue crew battling carbon monoxide gas. W9CEK's message, addressed to the Mine Safety Appliances Company, Pittsburgh, Pa., was 'phoned by W8DDG. The canisters were sent at once and arrived at Kettle Island next evening, in time to prevent any delay in the rescue work. W9CEK informs us that telephone and telegraph communication had failed to reach the rescue station at Pittsburgh, and that the telegram would not have been received until next morning, too late to be of any use. FB, W9CEK and W8DDG!

W9FNK was reported QSA5, R4 in New Zealand while working on the 3500-ke. band with one Type '10 with low input in the single control transmitter described in December (1929) *QST*. FB, OM!

The hamfest held at Ypsilanti, Mich., early in May reached the proportions of a convention with about 120 amateurs present. This is an excellent turn-out for a meeting scheduled for an afternoon only. The 32nd Division Signal Company, Michigan National Guard, furnished the Armory, which made an ideal place to hold the hamfest. W9GJX, Michigan's YL, made a 400-mile trip special to be at the get-together. Walt Colpus, W8BRS, was also among those present. The Signal Company cook "did himself proud" considering that 30 more hams than were expected showed up. The committee responsible for the very good success of the Ypsilanti hamfest consists of W8DMS, W8CEP, W8CAT, W8DYH, W8COW and W8VT. W9GJX cut the ribbons for the "markers."

WSAWO, Scranton, Pa., tells us how he used amateur radio at the Boy Scout Camp, where he spent three weeks this summer teaching the campers code. Just before starting to camp he conceived the idea that he would take along a short-wave receiver and schedule WSDHT, also of Scranton, as there was no telephone within two miles of the camp and he did not like the idea of such intense seclusion. A hurried look around the shack and the monitor was chosen to be the receiver. A few alterations and WSAWO had an entirely portable receiver. This was taken to the camp and regular schedules were kept with WSDHT. By means of this AWO was kept posted on important news events, and many important radiograms were sent to him. He says the only drawback to this arrangement was that he had no transmitter. Hi.

The Western Union Radio Club plans to conduct some tests with their mobile station, CT2AD, in the near future. 14,000 kc. will be used. Any amateurs hearing CT2AD are asked to report reception to the Western Union Radio Club, Horta, Fayal, Azores.

We were all beginners once and you know how good it seemed to find someone who sent slow enough for us to copy. Now that we can do our 15 or 20 per, let's not forget the men who have just received their amateur tickets. We should accept every opportunity to QRS for new men upon request.

Reserve officers of the 160th Cavalry Brigade, 65th Cavalry Division, organizations of which are located throughout Michigan, have established an army radio net for the purpose of maintaining contact with the various units and their personnel. Colonel George T. Langhorne, Chief of Staff of the Cavalry Units, states that it is intended to build this set so as to enable the headquarters of the Cavalry Units to carry on all work in connection with the Mobilization of Cavalry in case of emergency. Radio was used this summer for the first time in the history of the State of Michigan for the purpose of ordering Reserve officers to active duty. The net at present is comprised of some nineteen or twenty amateur stations. Michigan amateurs wishing to get in on this Net should write to Capt. Edward Jacobsen, 438 Book Tower, Detroit.

Section One, U.S.N.R., and members of the Amateur Volunteer Radio Net in Maine, played important rôles during the time the transatlantic planes, *Yellow Bird* and *Green Flash* were at Old Orchard, Maine, preparing for their trip to Europe. Upon a request from the Portland BC Station, WCSH, to assist in every way possible by furnishing weather and ship location reports, Mrs. L. E. Rowe, mem-

ber of the radio net and operator of her station, WIAJC, guarded the 600 and 2600 meter wavelengths constantly, and turned over all weather reports received for the use of the planes. Several other U.S.N.R. members were right on the job to assure the success of the important undertaking. Good work!

A little humor from Iowa:
W9ELV — "Why did you strike W9BCL?"
W9FZO — "Well, you see, he's been studying how to develop a magnetic personality, and yesterday he walked past me when I had a hammer in my hand!!"

A unique stunt was recently worked by W2BGO, W3AWB, W3OE, WSDPL, WSDYH, W8JD, W8VZ and W9DMT on 3500 kc. They all tuned their transmitters to the same wave and each guarded that wave with his receiver. By using break-in they were able to carry on an eight-way conversation! Various questions and answers were exchanged and when one of the gang would crack a joke, eight distinctly different signals could be heard coming back with a "Hi." Such a break-in chain provides plenty of fun, saves a lot of time, and best of all doesn't hog the whole band. Try it!

W8DBQ sent a message to Boston by radiophone via W1BDL. W1BDL telephoned the message, received a reply and sent it to W8DBQ by radiophone. Here's a case where two messages were handled strictly by voice, even to the delivery.

From W9ERU comes the news of a trancontinental traffic route that he has recently organized. It is called the "Trancontinental Air Express," and the motto of the stations on the route is "QSP, Quickest Service Possible." At present the route extends from W3NF to W8CUG to W8CRJ to W9EMR to W9ERU to W9DGW to W9FAM to W6BJF. Stations will soon be added connecting W3NF and W6BJF with New York City and California, respectively. The "TAE" functions daily except Sundays, all schedules being of at least twenty minute duration. We expect big things from this route. More power, OMs!!

W8CU suggests that if we would emit cleaner signals, we clean our dirty antenna insulators. Hi.

K4KD has been away from home for nine years with nothing but letters from his father and mother. He was recently QSO W9GDM who is located about twenty miles from his home town. W9GDM called K4KD's folks on the telephone and a most pleasant two-way conversation ensued. This is just another example of how amateur radio renews family ties.

DIVISIONAL REPORTS

ATLANTIC DIVISION

SOUTHERN NEW JERSEY — SCM, Bayard Allen, W3ATJ — W3SM, our RM and star station, again makes the BPL with a fine total. He reports working a Six with 3.5-mc. fone. W3AWL and the SCM visited him. W3ASG is spending two weeks at Camp Dix, as a Captain in the Medical Corps. W3AWL was recently on the ground of the local airport watching the SCM circle overhead, and was hoping the propeller would break so he could inherit the SCM's new receiver. W3OH is waiting for a new call due to a lapse in memory in renewing his station license. W3BAN is still chasing his jinx. W3AWH is a newcomer from Trenton and reports six new stations there. W3BEL, an old-timer, is getting back into the game and wants his ORS renewed. W3ATJ has been busy in the law office.

Traffic: W3SM 245, W3ASG 21, W3AWL 2, W3ATJ 2. MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Calhoun, W3BBW — Sure hope you fellows enjoyed your vacations. By the time you read this it will be time to start thinking of skeds for the fall and winter rush. Maryland: Sorry to say we lose one of our oldest ORS, W3CGC, who is now living in Phila. and working for A. K. factory. Wish you lots of luck, Bob. W3ADO, a non-ORS at the Naval Academy, reports FB, O. MW3LA is working on

a new receiver. W3PQ, a new ORS, is a Morse op and would like to hear from others in that line. W3AFF reports two new stations in Cumberland. W3NY had a QSP to Brazil and got it off in a half hour. FB. W3AGO sez he is too hot. Will W3BCA and W3BNC, the new fone hams he reports in Hagerstown, let me hear from them? W3DQ is another new ORS in Baltimore. Delaware: W3AIW leads this state and will soon be an ORS. W3ALQ had to build a fence, so didn't have much time for QSO's. W3AJH was QSO a ship at Bombay signing XWZZP. District of Columbia: W3BWT still holds the lead by a wide margin. Vy FB. W3OZ is looking for skeds. W3ASO came to life again. Hi. W3AKR is operating at WJSV. W3PM is lining up skeds.

Traffic: W3BWT 262, W3ADO 85, W3OZ 12, W3ASO 10, W3LA 8, W3AIW 7, W3PQ 6, W3AFF 3, W3NY 2, W3ALQ 1, W3AJH 7.

WESTERN NEW YORK — SCM, John R. Blum, W8CKC — The Erie, Pa., gang are sure to be congratulated for the excellent way they carried out the Atlantic Division Convention. The Western New York crowd had one fine time. W8CHG, W8CXH and W8CKC have their new extra frsts. W8AFM, W8IH and the R. I. are building 1000-ke. oscillators for frequency checking. W8IH is using 204A's in push-pull. W8AFG is back on the air; so is W8AYU. W8CXH uses German tubes in push-pull. W8AVM,

WSBIF, W8BUT, W8BYD, W8BXX, W8CXI are all trying out flea-powered fones and are working inter-city DX. W8CPC is consistently on 14 mc. W8CHI has turned pro for the summer. W8ALY is working on 28 meg. W8AWM works the west coast with a 201A. W8CLB is mostly on 7 mc. W8CMN is back on the job. W8CIL has a complete new 7½-watt transmitter. W8QL uses a gas engine drive transmitter — claims a thousand miles per gallon. W8TZ, W8BFW were at the C.M.T.C. W8BJO has installed a new filter system. W4QL visited us this month. W8BHK is off the air for the summer. W8AKC blew his plate transformer. W8BFG is home from his honeymoon. W8AFM is busy with frequency standards and 14-mc. fone. As to ourself, we have a new 14-mc. fone outfit and a new 204A on 3.5 mc. for traffic work. The Western New York stations are surely frequency conscious. The talk given by Dr. Grinnell (R. I.) at Erie was taken to heart. There has been more interest taken in monitors, frequency meters and frequency standards in this district than ever before.

Traffic: W8CIL 6, W8CK8 8, W8DSP 7, W8BJO 12, W8TZ 17, W8QL 38, W8AFM 2, W8DII 1, W8AFG 68.

EASTERN PENNSYLVANIA — SCM, Don Lusk, W3ZF — With the fan turned on and the temperature exactly 103 degrees, this month's report goes forward. W3UX reports poor results on the 14-megacycle band. W3NF reports inactivity until fall. W3MC continues his fine observation work with a new accurately calibrated monitor. W3DZ reported summer school QRM. W3TB will return with a complete xmttr for each band in the fall. W3AUR is at least consistent. W8CWO is helping the Red Cross arrange an emergency net up Scranton way. W3GS sez he has his hands full with Navy net. W8DHT is using a side swiper for summer diversion. W8EU is thinking of becoming an ORS. W8AWO just finished an AC screen-grid receiver, and it works FB. W3ALE applied for an ORS. W3AQQ also makes his first report. W8VD wants to correct the remark in July QST that his doctor forbid him to play with radio. He did it himself for his own good. W3ZF has a new job with the R.C.A. Victor Co. and has very little time for ham radio now.

Traffic: W3GS 102, W8EU 31, W3AQQ 29, W8AWO 16, W3TB 22, W3MC 21, W8DHT 16, W3DZ 13, W8VD 5, W8CWO 7, W3AUR 10, W3UX 10.

WESTERN PENNSYLVANIA — SCM, R. M. Lloyd, W8CFR — As the new SCM, I wish to thank you all and ask for your further cooperation. The reports this month are quite scarce, but I feel sure that some of them must have gone to the former SCM. W8CUG leads the section this month. W8GU says he finds 1850 kc. best for his schedule with W8BKM. He is also a new OO. W8DUT reports that W8APP is active and W8CLR is tutoring a class of Boy Scouts. W8DLG is still pleased with the results of his shield-grid detector. W8AVY is working on a new crystal transmitter. W8DVZ is using a reflector on his 7000-kc. antenna. W8CEO reports from Chicago, where he visited the CTRA. W8DNF has a new receiver and will be on 3.5 mc. W8AJV will be on 3.5 mc. also. W8CFR will be going full blast shortly.

Traffic: W8CUG 32, W8GU 20, W8DUT 13, W8DIG 11, W8AVY 7, W8DVZ 4.

CENTRAL DIVISION

INDIANA — SCM, D. J. Angus, W9CYQ — This represents the last report of your old SCM, who is retiring due to the fact that one cannot be a Director and SCM in the A.R.R.L. at the same time. One of the old-timers in Indiana, George Graue, W9BKJ, of Fort Wayne, has been elected to fill the SCM position. Send your future reports to George Graue, 824 Home Avenue, Fort Wayne, Ind. Your retiring SCM wishes to thank you for the co-operation and support given him during the past four years. W9BHM has the most selective h.f. super het in Fort Wayne. W9AAI is making a Condenser Mike. W9AXI is becoming the crystal expert of Ft. Wayne. W9DWL has his portable transmitter with him on his instruction trips with the Boy Scouts. W9GGP is rebuilding. W9CVX is the most active ham in Ft. Wayne right now. W9EPH is still on the air in spite of summer QRN. W9FXO has a 50-watt on 7000 and a 210 mopa on 14,000. W9FXM is building a new AC receiver. W9BZZ and W9EEH now have yellow tickets and are to operate WPDH, the new police radio station being built for the city of Richmond by W9CMQ. W9FAP joined the U.S.N.R. and also moved to Syracuse, N. Y., to operate WFRB. W9ESH moved from Mishawaka to Rockville. W9ETJ has a fone going at Rockville. W9FSG and

W9AEM are new hams at Mishawaka. W9AMI and W9DOD are on again. W9EDC is going to Chicago to live. Traffic: W9EGE 7, W9AKJ 10, W9FYB 4, W9EPH 8, W9AIP 39, W9AHB 2, W9BKJ 2, W9GFJ 2, W9CVX 17, W9CYQ 3, W9GJS 13.

ILLINOIS — SCM, F. J. Hinds, W9APY — First of all, gang, I wish to thank you all for electing me to the post of SCM. Your cooperation in any worthwhile plans started will be most acceptable. Tnx. W9ERU is getting out well with his Push-Pull TPTG 210, as described in June QST. W9FFQ is fooling around with an MOPA. W9BNO has a new bug. W9GJL and ex-W9DLI are back again. W9DLI has received his "WFA" card, and W9FFQ has a card from "WFBT." W9QI has been QSO WDDE once, but has been unable to hear him since. W9BNL, W9ANX, W9ACH and a few others are working up an emergency traffic system for the B. & O. Railroad. FB, OM's. (Others along the B. & O. right of way, and interested, get in touch with W9ACH.) W9CNY has been on 3500-kc. fone and 7- and 3.5-mc. CW with his remotely controlled outfit. W9ANQ is to be found only on week-ends, due to school work. W9FUR leaves for a big traffic month on the U.S.S. *Wilmette* this month. W9BDW is rebuilding into a Hartley with UV203-A and 281's. W9ALK will be with us again soon. W9DGG and W9FDJ are leaving the game. W9ASY worked all his traffic this month with CM8YB. W9AFN is trying to get his crystal to work. W9FCW reports the bands of 7 and 14 mc. being very quiet. W9FEA is now in Florida and may be reached via W4AIL. W9AFF handled a message for the "Hunter Bros. Endurance Fliers." W9BIR blew a filter condenser. The Xmttr at W9CUB went wrong, and all the experts in town could not fix it. W9GIV has wrecked his key arm with too much battery acid. W9CUK claims Maywood's record for losing filter condensers. W9FO and W8CNO are starting up schedules. W9FUL is a new station, and worked 200 stations his first month with bootleg 210's costing 23 cents apiece. Hi. AC receiver is a new addition to W9BRX. W9DZM went to the Rockford Hamfest and won four of the six prizes. W9FPN is trying fone on 3.5 mc. W9BVV sent his 210 to the "Happy Hunting Grounds." W9ACU was QSO W7QF using a 171-A with 200 volts, and received QSA5 R-9.

Traffic: W9DZM 168, W9AFN 40, W9ASY 34, W9AMO 25, W9FUL 15, W9BIR 13, W9FCW 12, W9CUH 6, W9DOX 6, W9QI 6, W9ACU 4, W9AFF 4, W9FPN 4, W9CKZ 3, W9BRX 3, W9DCK 3, W9BVP 2, W9CNY 2, W9GIV 2, W9ANQ 1.

MICHIGAN — Acting SCM, Ken Conroy, W8DYH — Things are going FB, even in this QRN weather. Keep it up, gang, and we will lead the show yet. Many boys are trying for ORS Certificates — W8ACW, W8BJ, W8BJT, W8CEG, W8CJ, W8CST, W8CVU, W8DFE, W8MV and W8MA. W8AJC's totals show the advantage of keeping skeds. W8CAT has two CC jobs on 3.5 mc. W8NR says thirteen fellows joined the U.S.N.R. V-3, in the past month. Write Ens. E. D. Glatzel, 139 Grove Ave., Highland Park, Mich., for information. W8CU is trying a new way to get an MOPA to hook DX. W8CE and W8BJT sing a duet on lousy conditions. W8BGY puts 1200 volts on a pair 210s! W9AXE still skeds 1YL. W8CKZ is off for the summer. W8BRS writes poetry — his subjects: static, hams, family ash cans and naughty words! W8DED will introduce a new tfe system in Amateur radio soon. W8PP hooked VK. W8WO handles a few, and says W8BNE will be on 14 with CC, soon. W8CEP can't open up on 3.5 without getting cards from ZL — sure tough, OM. W8BRO is about to enter the ranks of unhappy men: radio parts may be obtained cheap, soon (adv.). W9EQV and W9CEX are now comm'l ops. W8DFE is hot on tfe now. W8BJ has a record for all to shoot at: no tfe on the hook over 24 hours. FB. W8DFS will have a new receiver soon. W8ACW decided to get an ORS. W8DMS wants recruits for the Natl. Guard. W8CEG is at W9DOD for the summer. W8CST will be swamped when the gang learns he can QSP Cleveland — he skeds W8BDJ there, daily. W8DDO wants to mortgage his rig so he can get a larger plate transformer! Hi. W8DVQ is handling plenty of A-A tfe. W8DA, at Saginaw, ex-K6AVL, wants tfe and skeds. W8PM should have the big noise going on 7 mc. by now. W8SS will have his 204A on 14 and 28 mc. W8BPL sends in his first report. W8MA got his Amateur Extra First. W8PQ and W8CAM pound 7 and 14 mc. W8DEH is well again and is pounding lots of brass. W8BTK will have plenty of tfe next month. W8CJ is working all bands. W8MV are good sports — they run their 204A at half the plate voltage, because of lack of high voltage filter. W8DEN's theme song is "Silent Night," and

days, too! WSDYH discontinues code practice Sept. 1st.

Traffic: W8AJC 212, W9AXE 10, W8CST 20, W8CEG 11, W8CEP 5, W8SS 41, W8ACW 13, W8BRS 18, W8PP 3, W8MV 21, W8DYH 272, W8DED 36, W8BJT 41, W8DVQ 56, W8DDO 12, W8BPL 18, W8DA 6, W8DFS 19, W8DMS 25, W8BJ 16, W8BTK 17, W8MA 4, W9CE 3, W8CAT 16, W8SWO 9, W8CJ 18, W8PQ 5, W8DEH 9, W8DFE 9, W8BGY 2.

KENTUCKY — SCM, J. B. Wathen III, W9BAZ — DX and traffic don't hold half the lure in this hot weather as do speed boats and fishing. W9JL ran up a good total before leaving for the summer. W9GGB must have a touch of the wanderlust — just back from Okla. and now going to Brooklyn. W9DDQ is getting out well on 14 mc. with his 210. W9CEE is tearing up the Ohio with a speed boat. Green apples put W9ALR down for the count. We lose W9DAI. He moved to Gulfport, Miss. W9EYW is vacationing in Canada. W9FZV is back in B.G. W9AIN is all dismantled ready to move. W9BAN seems to be the only active station in the western part of the state. W9AUH is rebuilding to xtal control 7050 kc. W9ELL's 250-watter brought him the International Relay reward for Ky. W9AJY working U.S.N.R. skeds regularly. Our heavy hitters, W9AZY and W9OX, have melted away. W9BAZ is leaving for a cooler location. He expects to see all of Michigan and much of Canada before getting back. Don't forget to report regularly.

Traffic: W9JL 74, W9BAZ 40, W9BAN 10, W9GGB 9, W9AJY 5, W9DDQ 5, W9CEE 4, W9ALR 3, W9OX 2, W9AUH 2.

WISCONSIN — SCM, C. N. Crapo, W9VD — W9GFL is high traffic man this round. He expects to go to Camp Henry Grass with his portable, W9DMM, and threatens to make the BPL at that location. W9ART will take charge of the Green Bay traffic for him. W9AGY is a new ham in Green Bay. W9DJK paid W9GFL a visit during the month. W9FAW reports that he is attending Camp Williams with HQs Troop 53th Cavalry Brigade, and that they have a short wave set along. W9OT has been sailing and operating on NOZJ. W9HIB looked over W9DBJ while in Ft. Wayne. The SCM stopped at Hartford while on a business trip East and met the gang at Hqs. Let's have more reports, fellows!

Traffic: W9GFL 44, W9OT 5, W9FAW 2.

OHIO — SCM, H. C. Storek, W8BYN — It looks like old times to see Windy, W8CG, head the state once again. W8BAC comes in second, and says his six-tube super is dragging in the sigs (and messages). W8DHA is going to make a good ORS if he keeps it up. W8BKM is installing crystal on 1853 and 3706 kc. W8BGX drove 140 miles to help W8CX get his set perkin' on 3.5 mc. so they could schedule. FBI W8CNM turns in his first total. W8ADS says there have been too many storms to handle much traffic. W8DMX is being pestered with power leaks. He and W8BBR should get together. Hi, W8DPF says plenty of traffic and DX on 14 mc. W8DIH says they held their last club meeting at the swimming hole and says idea is FB. W8BBH reports air unusually dead on 7 mc. W8EJ reports that several Naval Reserve men of Youngstown are on a cruise. We are sorry to lose W8AQ and W8CFL from the gang. W8AQ has been transferred to Canada, and sends his best to all the gang, and W8CFL will be a W3 in Richmond, Va., and says he'll see you all from there. W8APC warns us that 600 volts are a few too many for a lone 245, and that's why his total falls 197 short of BPL. Hi, W8CIY wants leave of absence for a while until he rebuilds. W8CNO was "on the trail" again, to Chicago. W8BBR says it's too hot to work. W8RN is still on KFNA, but is looking forward to being with the gang this winter again. W8LI is going strong after traffic. W8ARP was transferred to Valparaiso, Ind., for an indefinite period. And now, let me introduce the new SCM for this Section, Harry A. Tummonds, W8BAH, 2073 W. 85th St., Cleveland, who will lead this gang on to newer and richer conquests in this good old traffic game. Congratulations, OM, and all I can say is that the leadership is in good hands, and that I know you will carry on for OHIO and the A.R.R.L. Gang, henceforth, look to BAH in every way as you did to me, give him the same support you gave me, and all together for A.R.R.L. As for W8BYN, I want to thank you one and all, for the loyal cooperation shown, and wish to say that it has been a pleasure to work with you. Hope to see you all at Dayton for the convention and — let's go, as of old, for OHIO, and the A.R.R.L. So long, gang.

Traffic: W8GZ 73, W8BAC 64, W8DHA 35, W8BMK 35, W8BGX 29, W8CX 28, W8CNM 21, W8ADS 15, W8DMX 15, W8DPF 13, W8DIH 11, W8BBH 8, W8EJ 4, W8AQ 4, W8CFL 3, W8APC 3.

X

AKOTA DIVISION

NORTH DAKOTA — SCM, G. L. Ottinger, W9BVF — The Jamestown gang had a visit from WICOW and W9AFM in July. W9IK had to miss his N. R. cruise. W9BVF is out telegraphing on the railroad now. W9DGS is using a B Eliminator on S.W. now and says it is FB. W9DFG is getting ready to rebuild. W9DGS and W9BVF have been playing lots of golf.

Traffic: W9BVF 14.

NORTHERN MINNESOTA — SCM, C. L. Jabs, W9BVH — W9ARE is on with a 203A while rebuilding his crystal rig. W9EHI has been traveling but is back home and keeps the new rectobulbs hot. W9EGU attended a luncheon at the St. Paul Athletic Club given in honor of L. V. Berkner, opr. of WFBT, while he visited the SCMs of Southern and Northern Minnesota. W9ADS is putting 390 watts into an 852 in a Hartley circuit. W9BCT's alibi is "too hot to stay home and operate." L. V. Berkner was the guest of honor at a banquet given by the Twin Cities' amateurs and a large delegation from Duluth and all parts of the state were present. The talk given by Mr. Berkner was immensely enjoyed by all. W9EXU, a YL op, was present at the banquet. W9DFI is a new station at Wilton and reports a visit from W9AIR. W9FAT is also a new station at Bemidji.

Traffic: W9ARE 17, W9BYH 13, W9EHO 4, W9EHI 3, W9AV 9.

SOUTHERN MINNESOTA — SCM, J. C. Pehoushek, W9EFK — The SCM is vacationing in Northern Minnesota and this report is written by the SCM of Northern Minn. in his absence. W9COS lives up to his reputation by leading the section and making the BPL. W9DRG has a sked with ZU6W. W9AQH has joined the Philippine route. W9AKN just returned from a vacation. W9GHO is planning on a tuned plate-tuned grid transmitter. W9DBC is getting back to normal from his sickness. W9CIX is going to summer school. W9FLE's antenna had a QSO with the wind and now rests on the ground. W9EYL has a new receiver using 224 and 227 tubes. W9AIR just returned from a trip to Winnipeg and Northern Minnesota and visited a bunch of amateurs. W9BHZ is on inactive list.

Traffic: W9COS 214, W9DRG 118, W9AQH 47, W9AKN 6, W9GHO 2.

DELTA DIVISION

TENNESSEE — SCM, James B. Witt, W4SP — Several ORS have failed to send in reports. Let's beat this next month, gang. W4KH worked all ZL and VK districts in 8 days. FB. W4AGW has applied for an ORS. W4VK has been at C.M.T.C. camp and visited the SCM on his way home. W4AFM is an old ham who used to operate W8VJ at Huntington, West Va. W4ADI is still having trouble with his transmitter.

Traffic: W4AGW 20, W4KH 20, W4AFM 4, W4AJQ 6.

ARKANSAS — SCM, H. E. Velte, W5ABI — Most of the gang have deserted their shacks for cooler recreation. Although W5BIB is rebuilding his transmitter he is still getting in the air, via his airplane. Hi, W5AQX is rebuilding his receiver. W5LV expects to be on soon with his new xtal controlled transmitter. W5HLG has been away to the Guard encampment in Florida. W5BMI is a big fellow in radio; weighs over 200. Hi, W5HN and W5IQ have been busy demonstrating their ham receivers. W5LK is on 3500-ke. fone. W5PX was married on June 6th. Congratulations, OM. W5ABI would like to test with some one on 28 mc.

Traffic: W5ABI 42, W5AQX 38.

LOUISIANA — SCM, F. M. Watts, Jr., W5WF — The Shreveport gang is still planning on the hamfest here in September. W5BJA is still in town. W5APN is a new station operated by K. J. Jumorille of New Orleans. W5ANA sees swimming and YL's are at their best in Baton Rouge. W5ACY has a new station using a 50-watter. W5BKL is back on now. W5RR is still pounding the ether with that 50. W5AKW is on a trip to N. Y., Ohio, and several other points in the north. Well, fellows, send in a nice report next month so we can fill a page of QST.

Traffic: W5ANA 26, W5ACY 14, W5EB 20.

HUDSON DIVISION

NEW YORK CITY AND LONG ISLAND — SCM, V. T. Kenney, W2BGO — Starting the next two-year term as SCM for our section I want the gang to know that we are going to have action in traffic-handling. If we do not get action from the ORS of to-day, we will have new ORS who will give us action. We have the gang on

the west coast to beat in traffic, you know, and the only way to beat them is by getting busy. Many new stations are operating here, and if they are interested in traffic work each one of them is requested to get in touch with W2BGO. Manhattan: W2BDJ is complaining of the QRN. W2CCR is operating W2CHH at Crafts, N. Y. W2BNL can be heard often operating his portable W2ZZH. Bronx: W2FF experiments on 28 mc. every Saturday and Sunday. W2AET tells us that QSOs are as scarce as gift shops. W2AFO, ORS and OO, is now a Bronxite, having changed his QRA in July. W2AQQ can be heard once in a while. W2VG is taking time out to rebuild both the transmitter and receiver. Brooklyn: W2ATZ is working lots of DX and moving traffic. W2BJY has rebuilt. W2BIV, ORS and OO, is going to summer school. W2ARQ has rebuilt and is using an MOPA with good results. W2APK reports QSO with HH7C. W2BJF spent some time at the N. Y. State rifle matches and is at a National Guard camp at present. W2BRB is working with 14-mc. fone and experimenting on 28 mc. W2CCD is superintending the construction of a shack in Finchville, Orange County, to be used for experimental work. Long Island: W2AVP, RM, skeds Lakewood, Pa., twice a week on 3.5 mc. and reports that W2AEC is operating at his shack. W2BFC remains active, and wants to thank W2BPS and Bob Ehrler for the aid rendered him in getting up a new Zepp and transmitter. The Boy Scout station, W2AYM, is in new quarters now.

Traffic: Manhattan — W2BDJ 10, Bronx — W2FF 23, W2AET 10, W2AFO 10, W2AQQ 2, W2VG 2. Brooklyn — W2ATZ 45, W2ARQ 40, W2BIV 15, W2APK 8, W2BJF 11. Long Island — W2AVP 50, W2BFC 2.

EASTERN NEW YORK — SCM, H. J. Rosenthal, W2QU — W2UO sends in his report while enroute for a two months' vacation in the Catskills. W2LU reports about one third the usual traffic, due to summer weather. W2ACB has cancelled all skeds for the summer months. W2BKN handled two messages so that his report wouldn't be entirely blank. W2AYK reports a 50% increase in traffic this month. W2BAI got a couple of columns of publicity in the local newspaper when they discovered he had received a QSL card from the Byrd Expedition. W2BER, the latest member of the traffic handlers in this section, sent in his first report.

Traffic: W2QU 284, W2BAI 52, W2LU 39, W2UO 20, W2BER 8, W2AYK 7, W2BKN 2, W2ACB 2.

NORTHERN NEW JERSEY — SCM, A. G. Wester, Jr., W2WR — W2FJ has started his Route Manager duties and promises to have an excellent traffic net working by fall. W2CTQ, W2ANG and W2HIR have lost their ORS due to failure to make reports. W2WR is still off the air. W2AOS has been appointed "Unit Commander" in the U.S.N.R. W2CWK asks for his ORS to be put on ice for a few months. W2JC reports that the members of the club had a moonlight outing at Mountain Lakes with fine attendance. W2AGX is doing fine DX on 14 mc. W2BPY pushed some traffic through the awful QRN. W2CJX took 19 messages direct from ZL 2AC on June 20. W2BY had an excellent vacation in Canada and visiting YL stations. W2JX has been bitten by the fone bug. W2BZB has been playing on 29 mc. W2CFQ has applied for an ORS.

Traffic: W2JF 29, W2AOS 4, W2JC 8, W2AGX 4, W2BPY 7, W2CJX 42, W2BZB 3, W2CFQ 6.

MIDWEST DIVISION

NEBRASKA — SCM, S. C. Wallace, W9FAM — W9EEW says weather conditions too bad, too much QRN and too hot for traffic. W9DVR has been rebuilding. W9EQR says it has been too hot in his shack to do much. W9DTH handles one tiny msg but promises more next time. W9BYG's xtal refuses to perk. W9BOQ is very busy with harvesting. W9BBS just got a portable call. W9CMY. W9BAN says his shack is the hottest place in the world. W9BEX is experimenting with Beam antenna. W9CPJ comes in with a total of 8 msgs, this time. W9EBF has been experimenting with small loop transmitter with a 201A and says she has a wallop. FB. W9FAM has MOPA perking now on the 3500-ke. band when weather will permit and says thanks to the fellows for electing him SCM. W9DI will be going strong soon. W9EXP has a peach of a note. W9EHW has been rebuilding antenna.

Traffic: W9BEX 13, W9CPJ 8, W9DTH 1, W9BHN 1. **IOWA** — SCM, H. W. Kerr, W9GP-DZW — "Hey, Skinny! Catch anything?" Some of the gang have been fishing for traffic, but — well they tried, and thanks, fellows. W9ACL leads and wonders if an ORS would boost tfe.

W9DZW is still planning that MOPA with xtal. W9WJ esz 50w 4-tube xtal per Handbook graces his den. W9FFD entertains the TSARC July 23rd to initiate a new xtal rig. W9EFQ has a new xtal and plans. W9FUD and W9ACL get on the Auckland list and the former on ZL, FB! W9DNZ is temporarily off the air, and W9FZO has been off. W9DXP has a more lucrative position in Chicago, so Des Moines loses him soon. W9AHX at Vincent is a new stn using 201A's. W9CPT, Des Moines, is an old Morse Opr. Director Huber is touring the west with a brother. W9DPL has sold out and is at Valp' trying for a com'l. W9FWG is schooling at Des Moines for 6 wks. for advanced Bell phone work. W9GKL qso'd OA4Q and displays a card. W9DGD admits he likes experimenting. Our glad hand to W9FAM, new SCM in Nebr. Thanks to the gang. GP, will wish for your loyal support the next two years and do his best. If you are not on our mailing list you are outaluk for "Regrete." Just add a sub to QST and let's get going for 1930-31.

Traffic: W9ACL 30, W9DZW 26, W9WJ 11, W9FFD 4, W9EQJ 4, W9FUD 1.

MISSOURI — SCM, L. B. Laizure, W9RR — W9ECI handled the most traffic in St. Louis this month followed by W9AMR, W9DYJ, W9FTA and W9PW. W9ECI is now an OBS. W9FTA is helping in this. W9AMR is trying to keep a sked with CE1AH while his uncle is in Chile. W9DYJ complains of poor contact on 14 mc. W9FTA did some more rebuilding during the QRN season. W9PW was reported from NZ on 3740 kc. with 2-210 tubes. W9CHG is doing more DX now that he moved down to 14 mc. W9EDK moved to Vicksburg, Miss. W9FUN says job QRM keeping him off the air for the present. Kansas City stations are somewhat on the shelf for the present. W9BMA is rebuilding. W9DQN says neighborhood QRM makers and school at the W. U. keep him too busy for much radio. W9CFL is on occasionally for ham QSO since suspending U. S. N. R. skeds until September. W9RR has been on a few times but QRN too strong for much luck. The South Mo. Assn. of Radio Amateurs was organized July 15th at Springfield by a group of about 20 present and a number reporting by letter. W9EYG was elected president, W9GAR vice president, W9GBR secretary, W9EBE treasurer. Amateurs throughout the state are invited to join this association. Dues, etc., are nominal and it is expected that some good hamfests that have been lacking for a long time in Missouri will be billed by the gang. Plans are now being made for such a meeting after Dec. 25th while the fellows are having holiday vacations. The annual meeting is held in July. W9CRM has been on a bit lately. W9GAR says rotten radio conditions in general have prevailed most of the time. W9CJB rebuilt and then had lightning come in and get the tubes. W9GJF is going on 7 mc. with a 50. W9FAL is on both 3.5 and 7 mc. but had a sunstroke and is laid up for the time being. W9CDU reports for Nevada and vicinity, keeping skeds with W9HL and W9AKZ. W9FCB is working a 201A set. W9CDU visited in K. C. and joined the U.S. N. R. W9BJA led the state for tfe with 78 msgs mostly on 14 mc. A new station is reported in Bethany. W9EPX still keeps his sked with W9EPY. W9BGN is rebuilding with sets for 28, 14 and 7 mc. and new antennas. W9DHN reports a new ham in Jacksonville, Mo. W9LI is beating the bush for rectifier equipment. W9ASV visited in K. C. and saw a number of local hams. W9FEQ has put in xtal. W9ENF built the June QST 14 mc. TPTG set and says FB. W9CLQ has built a new S-H receiver. W9FEQ and W9EUB both got jobs with W. E. W9EUB gets a regular sked with W5BEE for traffic south and turned in 2 originated, 6 relayed, total eight messages for the reporting period. W9EUB also reports W9FEQ on for traffic and handled 10 messages, all relayed for a total of 10. W9BHI reports from St. Louis that having a series of mishaps he has been unable to be on enuf to handle traffic for the past 6 months, but is rebuilding for xtal operation with an 866 rectifier and will continue to hold down his ORS if possible.

Traffic: W9ECI 32, W9AMR 27, W9DYJ 25, W9FTA 22, W9PW 16, W9GHG 4, W9BJA 78, W9CDU 8, W9ASV 33, W9ENF 5, W9DQN 7, W9RR 1, W9EUB 8, W9FEQ 10.

NEW ENGLAND DIVISION

WESTERN MASSACHUSETTS — SCM, Leo R. Peloquin, W1JV — With hot weather and vacation time, traffic handling is at a low level this month. The new SCM hopes the boys will rebuild and get started early for a banner season this fall. We should have more ORS in this section. All those who believe they can qualify are invited to write to the SCM for question blanks.

WICTF is busy playing semi-pro baseball. W1BZ says he expects his pilot's license this month, so he is on the air though not at the key. W1BZJ has a pretty d.c. note. W1APL says everyone seems to be playing with fone and on any Sunday morning the air is alive with them. W1COS is in the radio service business now. W1BVR has schedules Monday evenings with W1BU, W1FE, W1ADP and W1ASI, and Thursday with W1ABG. W1BNL "lost" one of his "S" tubes recently so is off the air for a few days until a new one arrives. The antenna mast at W1NS is being raised and repainted. W1ASU and W1JV are on their vacations. W1UM caught a QSA bass in Maine. Hi. W1BSJ is on for traffic every Saturday night on 3800 kc. W1NS reports on activities in Uxbridge.

Traffic: W1APL 17, W1BVR 11, W1BNL 8, W1BZ 8, W1NS 63, W1BSJ 5.

MAINE — SCM, G. C. Brown, W1AQL — The SCM was very pleasantly surprised in receiving a visit from Gladys Hannah, W1KY, of Cambridge, Mass., and a few days later "Boot" Black, W1LQ, from Wollaston, Mass., dropped in to renew old acquaintances. The Forest City boys are making every effort to give the gang a fine time at the Convention and everybody should make plans to attend. The Queen City boys recently enjoyed a very fine week-end outing at the summer home of Phil Gould, W1ALZ. W1ACV, formerly of Houlton, states that he is in Providence, R. I., and expects to be on the air soon. W1AQD says he will soon have two 204A's on 3980 and 14,000 kc. W1APU sends in his first report this month. FB, W1AHY is on Peaks Island for the summer and would appreciate any traffic from the gang. W1CDX reports that the hot weather has cut down his total this month. W1QH says that conditions are still very poor. W1BFZ states that power leaks and work have taken up most of his time. The Maine boys are very pleased to hear W1BCY, Commander Lee, U.S.N.R., on the air again this summer at Camden. The SCM wishes to remind the gang to keep in mind the new regulation in regard to renewing licenses. (All applications for renewal of license must be filed so as to be received at the offices of the Supervisor of Radio in charge of the district in which the station is located at least thirty (30) days prior to the expiration date of the license sought to be renewed.) W1VM reports U.S.N.R. activity.

Traffic: W1CDX 10, W1APU 10, W1BFZ 6, W1AHY 5, W1QH 2, W1AQL 2, W1VM 13.

CONNECTICUT — SCM, Fred A. Ellis, Jr., W1CTI — Traffic totals are some 215 lower than last month. W1MK handled three-quarters of all traffic reported. What's the matter, fellows? W1AOX takes time off from work long enough to send in a nice letter. W1AMG has received his appointment as Chief Telegrapher in U.S.N.R. W1TD is spending his vacation painting the house so radio takes a back seat for awhile. W1BI-W1BQH reports. Ex-IBNS is on with new call, W1CY. W1ATG is too busy with W1CAL and Naval Reserve work to be on much. W1RP installed a receiver in his car and entertains the YL's with BCL music. W1BVV wants skeds with Newport, R. I., and Groton, N. Y. W1AMQ thinks the gang must all be in swimming as traffic is a bit scarce. W1BBU reports that his skeds were void of traffic. W1AKI reports on the Bridgeport bunch. W1BAP sends in a nice letter. He is W2BYP located at Fairfield Beach for the summer. W1HQ has changed his QRA. While moving his antenna he was nearly pulled down from the ladder when a cow got tangled up in the slack wire. Last month we led the New England Division. Keep it up, gang. Let's give Weeks something to work for.

Traffic: W1MK 462, W1AMG 3, W1AOX 3, W1BVV 14, W1AMQ 27, W1BBU 1, W1HQ 9, W1CTI 20, W1AKI 8, W1RP 8, W1CY 7.

EASTERN MASSACHUSETTS — SCM, Miles W. Weeks, W1WV — W1CMZ again leads the section, and is the only one to make the BPL. FB, OM, W1ACH, W1BXB, W1P's, and W1ABG, all report having been on Navy cruises or Navy Yard duty. W1BXB visited W2BGO and W2SC. W1ACH and W1BXB still continue their schedules with W1MK. W1RV, off the coast of South America, was QSO with W1ABG. W1AZE now has his Extra First Amateur license and expects soon to have his new Xtal outfit perking. W1LM reports spending most of his spare time at his camp in N. H. W1BZQ has improved his note on 7150 kc. and reports traffic about as usual. W1CHR is operating at Nonquit, Mass., during the summer. W1CCP wants skeds on 3500 kc. W1ACA also has been on a Navy cruise and still finds a little DX on 14,000 kc. W1LQ looked up some of the Maine gang at Bangor and Brewer over the 4th.

W1ASI has a new 852 outfit now on 3500 kc. and is operator at WNAC. W1BLD is QRL at the Champion Tube Works and has resigned his ORS in consequence. The Radio Twins, W1KH and W1WV, have been more or less inactive due to summer vacations. W1KY is working on a combined shack for herself and the E.M.A.R.A. to be ready this September. Conn. and Eastern Mass. are making plans for a Division Traffic Contest, details of which will be announced later. Those hams working YSIX are reminded that W1RV is at the Key. W1ADK has applied for ORS appointment.

Traffic: W1CMZ 287, W1BXB 70, W1ACH 62, W1BZQ 49, W1ABG 48, W1ASI 32, W1WV 25, W1ADK 21, W1AZE 20, W1KH 16, W1ACA 13, W1CHR 7, W1LQ 5, W1CQN 5, W1LM 4, W1CCP 3.

NEW HAMPSHIRE — SCM, V. W. Hodge, W1ATJ — W1APK says he wants to have the best station in the section, so give him a little competition, gang. W1BFT is getting good DX on 14 mc. using an 852, and is building an MOPA fone to use at NHU. W1AUY says traffic there is all on the highway. Hi. W1IP has a brand new transmitter all set for fall WX. W1AEF says it is a grand and glorious feeling to be back on the air again!

Traffic: W1APK 32, W1BFT 6, W1IP 4, W1AEF 2.

RHODE ISLAND — SCM, C. N. Kraus, W1BCR — W1MO is perfecting a new a.c. receiver. W1BCR reports too much QRM from Tennis, etc. W1GV has been off due to a defunct 210. He reports that W1OU, W1AQ and W1AMV expect to be on again shortly. W1AFO is troubled with QRM fm. YL. Television pictures are received at the Radio Club of R. I. clubhouse nightly from W2XCR, W2XCD, W3XX, W2XR, W2XCW, W1XAV, W2XBS and W3XBV. Hams driving through R. I. are invited to drop in. Our land fone is East Prov. 3007-W.

Traffic: W1MO 8, W1BCR 6, W1GV 3.

NORTHWESTERN DIVISION

OREGON — Acting SCM, G. B. Sells, W7AMQ — W7UN is having a real vacation with the Naval

Reserves on a trip to Alaska. W7WL has been working G, ZL and VK stations. W7AMQ has been on 7 mc. most of the time lately. Mr. W7AJX and Mrs. W7AHJ send in a report. W6RJ has been visiting the Coos Bay hams. W7QY is recuperating after his trial for a commercial ticket. W7ED is putting in a quarter KW jug. W7BE will have a transmitter and receiver going at college next fall. W7QY has been QSO with a Swedish ship off Brisbane, Australia. W7IF has an a.c. receiver now and says its fb. W7KH was married and W7BJ made a very good best man. W7PC has been working in the mountains lately. W7WP spends his time grinding crystals. The Rose City Amateur Radio Club takes a little time off of radio and makes week-end trips to the mountains about two times each month during the summer. W7LP doesn't know whether to buy a new Ford or make a one k.w. high power transmitter. W7AEB is a good operator for one who has been on the air such a short time. W7AMF had the pleasure of being visited by W6BMS of Berkeley. W7ALM hits BPL by consistent Alaskan schedules.

Traffic: W7UN 19, W7AHJ 15, W7WL 7, W7BE 6, W7PE 5, W7QY 3, W7IF 3, W7AJX 3, W7AMQ 3, W7AEB 2, W7WP 1, W7AMF 23, W7ALM 177.

WASHINGTON — SCM, Eugene A. Piety, W7ACS — W7BB returned from his boat trip and right away took his usual first place in the traffic totals. Second place is held by W7AAE. Spokane reports via W7QF and says that the convention is going to be a humdinger. W7OV and W7TK went to Alaska on the Naval Reserve cruise and got some code practice at 30 per. W7KT finds time to be on occasionally in the mornings. W7AFX is busy studying for a commercial ticket. W7OJ reports two new hams in Aberdeen. W7AQB and W7TR. W7FJ has a new motorboat. W7AQQ, a new ham in Tacoma, reports for the first time. Another new one is W7APV, also in Tacoma. W7AJS is on now and then. W7ACS is having trouble with a single wire feeder, voltage fed Hertz. W7VC from Yakima reports for the first time. W7FD says that he has a 14 kw. bottle now. W7OI is back on the air and wants schedules for traffic work.

Traffic: W7BB 128, W7AAE 62, W7QF 29, W7KT 26, W7AFX 12, W7OJ 8, W7AQB 5, W7ACS 3, W7FJ 2, W7AJS 2, W7VC 1.

PACIFIC DIVISION

EAST BAY — SCM, J. Walter Frates, W6CZR-W6GB — In spite of the fact that the majority of the traffic men of the section are either on long vacations or temporarily off the air for the summer, W6AQ, the CRM,

staged a stunt during the past month to aid the dwindling traffic totals. He installed a transmitter and booth at the Pacific Aeronautical Exposition at the Oakland Airport under the portable call of W6SS. Considerable traffic was secured owing to the fact that the exposition was held coincident with the return of Wing Commander Charles Kingsford-Smith in the Southern Cross to the port where he had started his circumnavigation of the globe by air. W6AQ was assisted at the booth by W6AKB, and Mrs. W6AKB, who is W6ALH in her own right, officiated on the counter. A great deal of the exposition traffic, as usual, went through W6ALX, who came back to the top of the section again with a formidable total which should place him high in the BPL for the month. W6CQS of San Leandro, a new man, sent in two FB reports which have been incorporated in this report to Hartford. W6BZU says there is nothing of general interest at Concord except a little summer traffic. W6AOY is still managing to pound out some traffic after office hours at KRE in Berkeley. W6AN has just come back from a vacation in the Big Hills and expects to have his 3500-kc. outfit going in fine shape soon. W6HJ has been vacationing in the Seventh District. W6EDK has gone on the inactive list, due to illness. W6CGM says that traffic is on the blink and he can't find any more of W6AN's rolling stock to bust, so he is having a sad time. W6GQ has taken on a night trick on a San Francisco newspaper. His son, W6CFD, is back from his vacation and is giving the home station a great working over. W6EDS-W6CUM is using both the 14- and 7-mc. bands with good results. W6AKB has changed his QRA and has rebuilt along BC lines. W6EIB is still off the air at Vallejo. W6DQH of Modesto has moved into the East Bay Section and plans to have his station on the air soon. W6ASJ is still monitoring off wave stations. W6BSB sends word from New York City that the Second Romanian Arctic Expedition is to go ahead as per schedule and that he is on his way to Bergen, Norway, to meet Dr. Dumbava for the jump to Greenland. W6ZA is now a member of the Great and Honorable Order of Husbands and plans to have a low-power transmitter going in his new home soon.

Traffic: W6ALX 505, W6SS 171, W6CQS 38, W6AOY 30, W6BZU 8.

LOS ANGELES—SCM, B. E. Sandham, W6EQF—Nine stations make the BPL as follows: W6QP, W6CF, W6AVJ, W6DEP, W6EGH, W6ETJ, W6BEB, W6WA and W6CBW. Very good work, fellows. The technical staff of KNX leads the section in traffic totals, W6QP turning in 1306 and W6CF 1035. W6QP maintains one Philippine, one China, two Hawaiian and six U. S. skeds. W6CF entertains one Hawaiian and four U. S. sked keepers. The Pasadena Club had election of officers; T. E. Nikirk being President and T. M. Jordan Vice-President, with O. F. Martin being reelected Secretary. The Long Beach Club continues to hold forth over the City Jail, while the A.R.R.C. are looking for more favorable meeting quarters. Most of the members of the Bakersfield Club are at sea with the U.S.N.R.: W6WA and W6AOA are on the U.S.S. *Preston*, with W6ENQ and W6DFJ on the U.S.S. *Noa*. W6DZK is home from Stanford and sends in his first traffic report. W6AWY wires his report from Santa Maria. W6AVJ is coming on 3.5 mc. with xtal 'phone. W6EGH has good traffic report. W6ETJ, Chief Route Manager, is working now. W6DVA is coming on with xtal. W6CBW is now with KTM. W6AKW is taking a rest from Philippine skeds and leaving on vacation. W6BCK has 852 using 1500 on plate. W6DOZ sends in good report. W6ESA has his xtal going fb now. W6EKE received xtal as graduation present from W6ESA. W6EAF in high Sierras says no speed cops up there, roads fine and fishing ok. HI. W6OF says not much doing up at Mono Lake. W6BGF has moved to Puente. W6EQD is at Lake Arrowhead with portable and says conditions fb there. W6EFA has MOPA now and after tlc. W6CUH was QSO with Germany with input of 1.8 watts to xtal. W6ERL is at new QRA and after tlc again. Congratulations to W6HT, who was married last April. W6TE has a fine coat of tan, which accounts for the low tlc. W6EEP had W6ALA visit him. W6ASM fills in his report card with "YL" on line for schedules. W6ID is still struggling with his AC receiver. W6DZI is using telephone condensers for filter at ten cents each. W6FJ and W6ASM toured to San Francisco over the 4th of July. W6FJ is busy on location with movies. W6EQF had visit from W6ALA, also some people from Georgia who appreciated messages from the Philippines and consequently brought a home-cured ham (meat hi) for him from that state. W6BVZ heard his first Philippine station. W6BFI is going east for vacation. The

A.R.R.C. toured to San Diego and visited NPL by prearrangement with the Navy, and also boarded a submarine for a chicken dinner. Despite the warm weather, together with vacation season, the traffic totals have been most gratifying, and the SCM certainly appreciates this loyalty. This section has had the traffic banner awarded it almost every month. It leads the division, and the division leads the entire country in traffic, if not in all amateur activities. All tlc handlers who are not ORS may secure cards for reporting from the SCM — we want all your reports. W6AM now uses 3,000 feet of ground wire in fan shape and two ground rods 86 feet deep.

Traffic: W6QP 1306, W6CF 1035, W6AVJ 272, W6DEP 270, W6EGH 242, W6ETJ 204, W6BEB 180, W6WA 162, W6DVA 98, W6CBW 95, W6AKW 53, W6DLI 44, W6BCK 40, W6AOA 40, W6DOZ 34, W6ESA 33, W6EKE 28, W6EAF 27, W6CZT 23, W6AGR 22, W6OF 20, W6DZK 20, W6EQD 12, W6AWY 12, W6EFA 12, W6CUH 11, W6ERL 11, W6HT 9, W6TE 8, W6EEP 8, W6ASM 7, W6ID 7, W6EIP 7, W6COT 5, W6DZI 4, W6FJ 4, W6AKD 4, W6EQF 3, W6AZL 1, W6BXV 1, W6EOG 1, W6AXE 22, W6AM 13, W6BGF 43.

SAN FRANCISCO—SCM, C. F. Bane, W6WB—Vacations and rebuilding contribute to keeping the boys down. W6DFR seems to handle his regular traffic regardless of the above-named maladies. W6DPF and W6ATI are seen together so much that we suspect they must be making a still (with assistance from W6WN, Hi). W6DPF reports as usual. We receive a little unlooked-for help this time from W6BYT, who has settled down in S. F. W6ERK returns from his vacation in time to get his necessary 20 messages. Ex-W6DEK is back with us after a long absence, and now signs W6AVC. W6EPT sends us a letter and gives us the low down on things in the northern part of the section. W6ETR is installing Xtal at his station. W6CIS is back in town. W6BTO ground himself a rock and is making lots of pretty noises on 14 mc. W6AC is still grinding, and W6EEG is still thinking about grinding. W6ATI is still struggling with that new transmitter. W6FK is now playing golf instead of radio. W6PW is down helping fight the war at the National Guard Camp. W6KJ is planning on installing xtal in the near future. W6WN finally borrowed a rock and got back on after many, many months of absence. W6AMP is putting out a very respectable signal on 7 mc. The A.R.A. was honored by having Howard Mason address them at one of their meetings. Mr. Mason spoke on his experiences with the Byrd expedition. We were indeed happy to see Mr. Babcock at this meeting.

Traffic: W6DFR 119, W6DPF 29, W6BYT 27, W6ERK 21, W6AVC 8, W6WB 7, W6ETR 7, W6WN 6, W6AMP 4, W6KJ 6.

SANTA CLARA VALLEY—SCM, F. J. Quement, W6NX—Summer time, that period of the year when amateurs forget radio and take to the ocean and hills, is with us again. W6DQH, RM, has moved to Oakland where he will attend radio school preparatory to following the commercial game. W6ALW handled his consistent traffic this month. W6BMW is still working on portable 'phones for govt. Heavy QRM is handicapping W6DCP. W6AME is busy with BCL sets. W6BHY would like skeds for San Jose traffic. W6KG is now President of the S.C.C.A.R.A. W6SV tested during June with 1000 watts on 28 mc.

Traffic: W6ALW 29, W6BMW 14, W6DCP 3, W6NX 2.

SAN DIEGO—SCM, H. A. Ambler, W6EOP—Our new ORS, W6AXV, leads this section and makes the BPL. FB, OM. W6BKK turned in a fine report. W6CTP worked PY with his 171. W6EOP is now back on the 7- and 14-mc. bands. W6EOS is up in the mountains with portable. W6CTR will soon be on with a new 50-watter on 7 and 14 mc. and a couple of 210s on Fone Band. W6BAM was trying out the 28-mc. band, but says no luck yet. The SCM would be glad to hear from new hams and has room for several new ORS.

Traffic: W6AXV 202, W6BKK 100, W6EOP 11, W6CTP 2, W6CNK 1, W6BAM 1.

ARIZONA—SCM, H. R. Shortman, Jr., W6BWS—W6ALU leads the state with an excellent total, also placing well in the BPL. W6EOF has moved station back into the shack. W6EFC has been rebuilding. W6EEB-W6ECW is getting enough radio at KESI, and is working from W6EOF occasionally. W6ANO writes the SCM that it is nice and cool in Flagstaff. W6VV-W6BWS reports a new transmitter at KGSJ. The gang who are in the National Guard, W6BJF, W6EAA, W6CWI, W6CDU, ex-W9EH, and W6ALU are going to Flagstaff for camp. W6EOF is in Prescott on his vacation.

Traffic: W6ALU 257.

NEVADA — SCM, K. L. Ramsey, W6EAD — W6BST and W6CDZ are building a portable 3500-ke. 'phone outfit which W6BST will take with him to the National Guard Encampment at San Luis Obispo, Calif. W6BST intends to hold skeds with W6CDZ in Reno. W6AJP is an ORS again. W6EAD is rebuilding entire station. The N.A.R.A. adjourned until August, when the University of Nevada opens again. W6UO is busy with Army-Amateur work. W6BUB (Portable) of Berkeley, Calif., is in Yerrington with a fb. portable 'phone on 3500-ke. band. W6EGA is working on 3500 ke.

Traffic: W6COZ 5, W6AJP 6.

HAWAII — SCM, L. A. Walworth, K6CIB — There are 12 ORS in Hawaii now as follows: K6 — EWB, CIB, ALM, DV, ERH, CFQ, BOE, DUD, ACR, AJA, ERO, CDD, CFQ and CDD are on the inactive list at present. Mrs. AJA and Mrs. EGD of Hilo expect to take the Ham exam. soon. K6CIB shipped his entire 50-watt station to his brother, who is a medical missionary in Peru, S. A. Listen for Rev. Walworth of Pomeria, Peru, in November, on 7 mc. His station will be on head of Amazon, and QSL's will be many weeks getting out. Hawaii has set a precedent for out-laying sections like Philippines, Alaska and Porto Rico, by holding an Official A.R.R.L. Annual Convention. It is hoped Hawaii may have a delegate at the Annual Pacific Division Convention in Sacramento, Calif. QSL's for unlisted stations may be sent to the SCM. K6BJJ is stocking Amateur Radio Call Book now, and this is very welcome news to locals. Ex-K6BC, W. I. Harrington, engineer of Mutual Telephone Co., is very busy installing the ultra short wave radio fones for Inter-Island service. K6EWB has resigned from OBS work. K6DV has been appointed OBS with following schedule: Tues., Thurs., and Sat. at 9:00 p.m., H.S.T., and Sunday, 1:00 p.m., H.S.T. Hawaii has again broken her traffic totals with 17 stations reporting a total of 2665. K6EST is just home from Uni. Hawaii. K6CIB hopes to announce an Affiliated A.R.R.L. Club in Hawaii next month.

Traffic: K6EWB 1475, K6DV 372, K6ACR 227, K6EVW 138, K6DUD 130, K6AJA 67, K6BOE 54, K6DQK 37, K6AVL 36, K6CIB 34, K6ALM 21, K6CMC 18, K6ERH 16, K6ERO 12, K6EST 12, K6BJJ 13, K6ACW 3.

PHILIPPINES — Acting SCM, John R. Schultz, K1AJR — K1AJR will soon sport a half kilowatt transmitter. K1AIC is just back from a pleasure trip to Japan. K1AAW is again on the air after months of absence in China. K1ACE is handling the bulk of Manila's traffic. K1AXA and K1AIHW are new dx getters. K1IHC, in spite of his newly born operator, is heard nightly. The ops at K1ICM are busy learning commercial traffic handling. K1APB is occasionally heard. K1IDJ is busy with regular schedules. K1AJR worked J2CB in daylight on 14 mc. K1AJR will soon be heard with his radiophone.

Traffic: (May-June) K1AJR 697, K1ACE 200, K1AAW 114, K1AJR 69. (June-July) K1AJR 871.

CHINA — Reported by AC8HM — AC9GH sends in fine report of activities in Hangkow section. AC8WD uses stick of Chinese agar for grid leak. AC8BO is chief operator on one of the river boats. AC8ZC, in Changsha, is keeping daily schedules with Hangkow. AC9GH has been especially active keeping schedules and helping the boys with their troubles. AC2AY also has nice report from Tientsin section. AC3MA again is on the air. AC3XJ has active traffic schedules with K1ACE. AC2AY keeps three daily schedules with K1AJR. AC2MK has been closed down. AC2CB is new Peiping ham. AC1BX, AC1TS and AC1TK are active. In Shanghai district AC1SAG helped re-install AC8WE and AC8TJ. AC8TJ is mourning for two 227's. AC8RB is busy with new antenna and coils. AC8LS is experimenting. AC8JS is putting in new power transformer. During month AC8WB and AC8GV returned to us. AC8HM has moved to new house.

Traffic: (May-June) AC2AY 45, AC2MK 10, AC8AG 95, AC8GO 30, AC8HM 187, AC8WB 57, AC8GH 61.

ROANOKE DIVISION

NORTH CAROLINA — Acting SCM, J. F. Bivins, W4AEW — Prof. Caveness, W4DW, has been elected SCM of this state and will take the helm from now on. The question arises as to what he will have to steer. The old boat, North Carolina, is mighty leaky right now just because most of you fellows won't take time to drop your SCM a line once a month and let him know what is going on around the shack. There is plenty of activity and the motors are still turning, but the propellers don't seem to

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be attached. Have a heart and spend five minutes to let Caveness know about things, and the result will be that the good ship Tar Heel will once more get under way and we will all be proud to be members of her crew. W4DW is still trying to find out why the Mopa won't work as well all dressed up as plain naked. Hi. W4TN says that he is snowed under with haywire right now. W4AEW is putting in a 100-watt station and will be off the air for a while. W4TS, our erstwhile SCM, seems to feel relieved of his duties and is sharing time at the key with W4ZW, who is visiting in Canton. W4ZB reports DX galore.

Traffic: W4AEW 37, W4DW 12, W4TN 7, W4TS 6, W4ZB 58.

WEST VIRGINIA — SCM, D. B. Morris, W8JM — Everyone seems to be rebuilding for fall activity, or away on vacation. Ex-W8ACZ is opening up on 3500 ke. with a new call using 250-watt with 866's. W8BCN gets his traffic thru very bad QRM. W8DNN was married recently and promises to make an "Op" out of the "Ow." (Congrats, Forrest.) W8WBK reports two new hams in Wheeling, W8BJB and W8CSF. W8BOK is on 3500 ke. using both "Fone" and C.W., and reports activity on increase in Clarksburg. W8VZ dropped in town for a few days and worked quite a few stations. W8JM wants the reports of all stations handling traffic regardless of whether you are an O.R.S.

Traffic: W8SP 20, W8BCN 19, W8JM 17, W8WBK 7.

VIRGINIA — Acting SCM, T. P. Mathewson, W3FJ — Yes, Suh! A cordial welcome and a great hamfest awaits all hams attending A.R.R.L. Convention in Richmond Sept. 19th and 20th. W3AG and W3AU got nice publicity for their cooperation with W3SN in reporting Air Corp planes as they left Bolling Field for a simulated attack on Aberdeen. W3CA has completed that new transmitter. W3BDZ is using xtal and sounds beautiful. W3ZA put in good work on his 'phone while laid up with injured foot. W3WO promises to be on again soon. W3KR is leaving the State for a while. W3ASI is the only active station up in his neck of the woods. W3ARU with its many ops is ever active. W3ABC handled a few. W3NO is now with WTAR and trying to organize the Norfolk gang. W3AAJ is Convention Chairman, but finds time for his scheds. W3FE is also busy on Convention plans. W3AVU with W3AMB at key, located at Scout Camp near Richmond, and W3FJ kept three-day skeds on 3.5 mc., and both made the BPL. The Richmond Short Wave Club will have a booth at the Radio Show in the Mosque Sept. 15 to 19th with Friday, 19th, as "Amateur Nite." W3CKL went to Schenectady instead of N. Y. C., and we hope to hear him in that section.

Traffic: W3ARU 12, W3AAJ 37, W3ASI 27, W3AG 2, W3ABC 3, W3ZU 2, W3AEW 6, W3AVU 131, W3FJ 168.

ROCKY MOUNTAIN DIVISION

UTAH-WYOMING — Acting SCM, C. R. Miller — W6DPJ-W6ZZZ — The SCM is away this month, so W6DPO is writing this report. W6ZZZ tops the list, and just missed the BPL by a few. W6DPO makes the BPL on deliveries. W7ABO shows fine work for his first report. W7AAG is on with 100 watts, using a large filter. W6EKF blew his filter so is back on CW for a while.

Traffic: W6ZZZ 183, W6DPO 65, W7ABO 26, W7AAG 9, W6EKF 3.

COLORADO — SCM, C. R. Stedman, W9CAA — The SCM is out of the state for a time, and some reports may as a result fail to reach him. However, arrangements have been made which will insure all future reports getting thru OK. W9CAA has been dismantled for the time being and the ORS cancelled. W9CAB is taking a vacation in New England. W9FPZ is on the air at Canon City. W9EDM is operating W9BCR, the Boy Scout station at Camp Horne. W9ECP blew up a lot of stuff, but borrowed enough junk to get back on the air. W9FQK and W9FQJ are two new hams at Greeley. The radio inspector at Denver has applied for ORS for his ham layout. W9EFP is too busy on the farm to handle any traffic. And now for the brass pounders. W9DQD has sets on 7000 and 14,000 ke. and a schedule with W6ZZZ two days a week.

Traffic: W9DQD 29.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Robert E. Troy, Jr., W4AHP — W4AHP and W4CB have just returned from C.M.T. Camp. We are sorry to report that W4AHR had to resign from the A.A. W4AAQ is now state N.C.S., with W4AHP alternate. W4AGI says he is alive and kicking at

QST FOR SEPTEMBER, 1930

Tarrant City. W4AP is experimenting with transmitters. We welcome a newcomer, W4GX. Good luck, OB. W4ZI, W4VY, and the rest of the Troy bunch are putting in a club station. W4CB broke two 50's, but is getting two more. W4HB visited the SCM, and says he is living at Greensboro now. W4AHR and W4AHP are operating the "radio in every room" for a local hotel. W4AJR is having receiver trouble. W4AKB is operating a little now. Wake up, fellows, let's get going for the fall season.

Traffic: W4AAQ 34.

GEORGIA-SOUTH CAROLINA-CUBA-ISLE OF PINES—SCM, M. S. Alexander, W4RZ—W4AFQ is operating the new broadcast station at Augusta, Ga. One of the transmitters at W4ABS was destroyed by lightning last month so they are rebuilding the set with 250 watts xtal control. W4HU is working at a broadcast station at Columbus, Ga. W4QE is going strong with a 50-watt MOPA. W4AIG has a 50-watt MOPA now. W4KV makes up for lost traffic on Monday nights on the Army Amateur net. W4JL has got back on the air. W4SI made the BPL and handled more traffic than any one else in the Section. CM8UF is working a transmitter on 14,224 kc. and has quite a few good schedules. The Atlanta Radio Club is going strong again. There is still room for a lot of ORS. Let's hear from you if you are interested and can handle traffic.

Traffic: CM8UF 12, W4SI 243, W4JL 8, W4KV 105, W4ABS 47, W4AJH 19, W4DV 6, W4GT 2, W4SS 36, W4AY 39.

FLORIDA—SCM, Harvey Chafin, W4AH—W4PAW—Well, fellows, this is a very short report this month, as I was away on my vacation and did not get back in time to write a very long report, although I have been on a fishing trip in North Florida and caught some very nice and large bass. I think from the reports this month everybody has been on some kind of a trip or so. If not with some one, they have gone with some one else. The Naval Reserve Cruise was taken by W4BG, and Mr. Shriner, Lieutenant of the Tampa Unit, W4JO in Miami and quite a few others of whom did not send me a report. I sure would like to have a list of the ones in Florida making the cruise that did not send in a report. The first report this month was from Miss W4ABG, who has a nice report for the amount of time she has on the air. I would like for W4AGB to induce W4NN to send in reports more often if possible. The SCM hears W4QN in QSO with W4AGB quite often. What does this mean, OB? W4OK reports again for W4ABK and W4AFN. W4AFN received a card from Russia this month reporting his sigs QSA 4 R4, and he is using two 201's. W4ABK has a 50-watter but no filter yet, but will be on the air when he gets some, and he says he hopes it is soon. W4OK has a nice total this month and is using two 201'a tubes with AC on the plate; although he will be off the air for a while, he is going to have some rectification. W4ALH is only keeping one sked, as the wx has been very bad for reception on all signals lately. W4QN had some mighty fine luck this month by working a Chinese station. The SCM will testify to it, too. Hi. W4OY is a new ham in New Smyrna, and this is his first report. Congts., OB, for the report, and don't forget the date to report the next one, OB, always on the 15th. W4KK is doing all of his operating at NDU, the U.S.N.R. station in Jax. He is trying to get his ham sta going. W4AGY sends his report from W4LA this month, and says his station will not be active because his equipment is at W4LA and is applying for a ORS for that station. W4AEA is shutting down his station until fall, although he is operating W1AWF. The two stations over in Plant City, W4ZU and W4ZV, are going fine now and are applying for ORS appointments. W4JO reports a nice trip to Key West for Naval training. W4TK says he is still alive, but no messages handled. W4TG is feeling mighty fine this month as he worked a few VK's and ZL's. W4UJ also reports for the first time with seven msgs. W4JH makes the BPL this month with 201 msgs. W4AGR also reports, but nothing much doing down there. W4AKH reports from Hendersonville, N.C., this month, and is coming home soon and rebuild. W4MM has a 250 going over in Clear Water, but no one ever hears it. What's the matter, OB? W4KM is on the air some now. I received a letter from W4QP from Key West, where he has been in the Marine Hospital for some time, and he says he will be on the air about 24 hours from the time he arrives at home. Hi, when will that be OB? W4AEM is a new station in Jax, and is applying for an ORS appointment. W4CK has moved to a new address and has raised his masts to about 45 feet in the air. Ex-W4AGB,

now up in Buffalo, N. Y., sent the SCM a report of his sigs, and says it sure makes him feel homesick to hear the fellows down here. W4MS reports for W4PN and W4FV. W4MS has a set on most all bands now, and is experimenting on 10 meters. W4FV is instructing aviators for the U. S. Navy and the U. S. Marines. W4VR is rebuilding his station. W4ACO has lost his call, and wants to sell out for 35 berries. Hi, don't give up, OM, send in for a new call; there are plenty left. W4ACB and W4VR made a trip to W4JD's place up in Georgia. W4MS says in case W4AAB does not mention it that he has a FB baby girl operator now. Congrts., OB, and hope she will be on the air from there in the near future. W4ABJ is up in Mass. working on a ship. Let me have your reports, fellows, as we sure want Florida on the map this year, and if your station is not mentioned it is because you did not report it. Send in news of all kinds, and your vacation experiences, so we can have some news for QST. Don't forget to send your reports on the 15th.

Traffic: (Too late to be listed in Traffic Summaries) W4JH 201, W4OK 159, W4AFN 112, W4AGR 85, W4TG 27, W4JO 25, W4AGB 22, W4KM 22, W4ALH 47, W4OY 15, W4MM 8, W4UJ 7, W4QN 7, W4CK 5, W4LA 3.

PORTO RICO-VIRGIN ISLANDS—SCM, E. W. Mayer, K4KD—K4AKV finds conditions bad and traffic scarce. K4ACF did a bit of traffic work. K4DK has been forced to look for a new QRA. K4AAN loses his ORS through failure to report for three consecutive months. K4KD is exhibiting the only WAC in the section held by an active station.

Traffic: K4ACF 7, K4KD 5.

WEST GULF DIVISION

NEW MEXICO—SCM, Leavenworth Wheeler, Jr., W5AH—Again nearly every one reports poor conditions on 7 mc. W5AOU is rebuilding his complete station. W5AJL has another new receiver and reports good results from the new 50-watter. W5EF plans moving to escape QRM. W5BHY is planning to resume his fone operation this fall with a new 100-watt rig. With the above, plus W5FF, W5AGX, W5BMR and W5BMT, Clovis is the "hammiest" spot in the state. More interest is being shown in Albuquerque with three new stations, W5AJR, W5AOE and W5AUW on daily. W5BH, we're glad to hear, is getting out of bed occasionally and seeing the country. W5AIE says there's nothing like his new SG AC receiver. W5ND gets on once in a while when his Hertz is up. Hi. W5TV, on his vacation reports severe radiation and QRM from his sunburn. Hi. Tfc is picking up at W5AHI.

Traffic: W5AHI 121, W5AOU 8, W5AJL 4, W5EF 2.

SOUTHERN TEXAS—SCM, Robert E. Franklin, W5OX—The Houston Amateur Radio Club is about the most enthusiastic bunch I ever saw. The club was organized in mid-summer and has increased with every meeting. More power, OMs. W5EI, our newly appointed Route Manager, is on a vacation touring the Southern Section trying to get a bunch of skeds lined up for some real traffic handling. W5BKW is contemplating putting in a higher power xtal controlled job. W5UX sends in a nice report and says that he will be at the Convention with his best Whoopee suit on. The Houston bunch has the best line-up for a convention you ever saw, and you are going to have the time of your life when you come to Houston on October 10th and 11th. W5ZG sends in a report for Galveston. W5AVC is a new station using one 204A. W5BBL blew up his power supply and is now figuring on a higher power outfit. W5ZG reports not much doing on account of business. W5AEA just returned from a vacation in Colorado.

Traffic: W5EI 52, W5BKW 43, W5UX 38, W5TD 14, W5ZG 11, W5BBL 5, W5AFF 3.

NORTHERN TEXAS—SCM, Roy Lee Taylor, W5RJ—W5HY leads again and has a sked with Honolulu. W5BAM reports a bunch of old hams getting back on the air in Dallas. FB. W5LY wants sked in the pm. W5BIP worked his first K6. W5ARV wants early am sked. W5ASP is on vacation in New Mexico, where he is using Portable W5BOO. W5DF says three new hams in Paris. Our section needs several more real active ORS. Come on, gang, let's get things lined up for the winter. W5IJ is pounding out a few.

Traffic: W5HY 60, W5BAM 23, W5BIP 9, W5ARV 8, W5LY 12, W5ASP 3, W5RJ 5.

NORTHERN TEXAS GET-TOGETHER

On Sunday afternoon, June 20th, forty-six amateurs of Northern and Central Texas met at the Chamber of Com-

merce Building at Cleburne for a good old get-together and hamfest. This meeting was the second of a series which have been planned by some of the gang who want the fellows within a radius of a hundred miles or more to get together more often than just once a year, when they gather at the Annual Division Convention. Many fellows are able to attend these meetings who are not able to make the Division Convention. The amateurs who attended the Cleburne meeting wish to thank the Cleburne Radio Amateur Transmitters Club for the splendid time had.

The next meeting is to be at Fort Worth on September 21st. The exact location will be announced later. Every amateur interested in having a good time is urged to attend. The question is whether or not a permanent Association of North-Central Amateur Transmitters shall be formed will be discussed and voted on at this meeting.

OKLAHOMA — SCM, W. J. Gentry, W5GF — W5VQ is high man for this month. W5GF has been rebuilding. W5AYF has a little tfe now and then. Glad to welcome W5BOR, and would like to hear from him again. W5OJ is getting an ORS certificate soon. W5ASQ is going to try 28 mc. W5AVG is going to Alabama soon. We sure don't like to lose you, Om. Now is the time to get ready for the fall season, fellows.

Traffic: W5VQ 77, W5OJ 32, W5ASQ 12, W5GF 8, W5AYF 8, W5BOR 8.

CANADA

To all Canadian Amateurs and their friends who sent Birthday greetings to the Prince of Wales, the following message of thanks was received from London via G5ML. "The Prince of Wales sends you sincere thanks for your good wishes which his Royal Highness much appreciates." When we again have the opportunity of sending greetings to any member of the Royal Family we hope more stations will take part in the broadcast and that weather conditions will be better.

As we are still in the midst of vacations I will not criticise too severely the very few divisional reports received this month. In the future each SCM must report to me on the 15th of each month even if he has not had a single report from his division.

The attendance is increasing every Wednesday night. If we keep this up our dream of making Wednesday night "All Canada Night" will be a reality before the snow comes.

CANADIAN GENERAL MANAGER
ALEX REID, VE2BE

VANALTA DIVISION

B RITISH COLUMBIA — SCM, K. Cavalsky, VE5AL — VE5BM has had difficulty keeping his skeds. VE5CR is still going strong. VE5CF is looking for big things in the fall. VE5AK pulled the magazines off his table and found his key again. VE5BC is at his summer home. VE5AH is putting out a wicked signal. VE5AL hooks the odd station on week-ends. VE5BP is having trouble with his heap. Several of the gang are making themselves heard on phone. The B.C.A.R.A. had a dinner party recently and, like all ham gatherings, it was a great success. VE5CT is clearing out his junk, and we are very sorry to lose one of our oldest hams. VE5BR has had to call off all skeds until September. The Victoria gang is sure stepping right along. VE5CO has a few good reports from ZL. VE5EC is getting out better, but can't get a DC note from the old set. VE5DU worked his first ZL. VE5AD has left on a Cannery job. VE5CB is getting out OK. VE5HP and VE5CJ are on regularly. VE5HR has receiver trouble. VE5AG puts out a nice note. VE5AW says fishing is good. VE5GT is on 7300 kc. with xtal.

Traffic: VE5AC 3, VE5CF 3, VE5CR 2, VE5AW 12, VE5AL 7, VE5EC 7, VE5BM 4.

ALBERTA — Acting SCM, G. E. Panter, VE4AF — Summer weather, poor radio conditions, and vacations united to cut down amateur radio activity in Alberta during the past month. The radio convention held here on July 1st was, from all reports, an eminent success. Among the visitors to the con were: Mr. and Mrs. VE4EI, 4GM, 4GD, 4BQ, 4GY and ZL3AX. 4BQ has his hi-power mopa well under

way, and 4GD is now clicking with the DX with a new outfit. 4EI says holidays cut all activity at that station. 4HM, 4EA, 4BJ, 4BW and VE4AF are heard QRM'ing Edmonton 7- and 14-mc. spectrum. ZL3AX, who has been spending a short time in the city, is leaving for Toronto. VE4AF finds his income cut off and expects to leave shortly for parts unknown. 4DZ is making a holiday tour to the American first district.

ONTARIO DIVISION

ONTARIO — SCM, E. C. Thompson, VE3FC — VE3GT heads the traffic list this month with a nice total. From VE3GK we learn that Mrs. "GK" has passed her examinations and is impatiently awaiting her operating license. FB, and welcome to our midst. VE4HE seems to have had all the luck having hooked PY1BA, PY2BA and NL8MRC. VE3DA says that VE3HI is now on the air in Belleville with a pair of 210's in push-pull and a 4-tube all-electric receiver. VE3DW now has two operators, Mrs. "DW" having qualified and received her papers. Welcome, Mrs. "DW". VE3AD is with his portable on 7 mc. in Muskoka. VE9BJ is at his summer home on Toronto Island. VE3JW was recently married. Congratulations from the gang. VE3BL visited Ottawa on his motor-bike once more to see VE3XM and VE9CC. VE9AL is at Stoney Lake again. VE3GM motored to Boston, talking to his father via Amateur Phones en route. FB. VE4FC hasn't licked the screen-grid detector into submission yet. Hi. VE3FD has gone to Montreal, with our best wishes. VE3DD is in the North on Forestry service. VE3CB has been fishing, but has returned to radio, where he fishes again. An that's that.

Traffic: VE3GT 19, VE3HE 10, VE3GK 10, VE3DA 5.

QUEBEC DIVISION

QUEBEC — SCM, Alphy Blais, VE2AC — Our CGM, VE2BE handled 23 messages from LZ2AC. VE2AX has been in bed these last two months. Let's wish him a speedy recovery. VE2CA is going strong on 14 and 7 mc. VE2BB keeps up his work as usual. VE2EY was down to see VE2AC this month. His OW is quite an amateur herself. VE2AP is out doing field work. VE2AC handled quite a pack of messages from tourists passing by. VE2BG pushes the traffic through and works DX also.

Traffic: VE2AC 252, VE2BE 129, VE2BB 28, VE2BG 17, VE2CA 5, VE2BM 4, VE2AS 4.

PRAIRIE DIVISION

SASKATCHEWAN — SCM, W. J. Pickering, VE4FC — The good old summer weather is certainly playing havoc with traffic these days, but as our C.G.M. says — if you can be on only one night a week, make it Wednesday night. VE4GR says that contacts on 7 mc. are very scarce and VE4 stations are seldom heard, even at noon. VE4IH sends us the news of a new ham starting near him as well as an XYL. Prince Albert has an XYL pounding brass now under the call of VE4AV. VE4BB reports being able to QSO stations in daytime that ordinarily would only be heard at night, and that all signs QSB about 11 at night.

Traffic: VE4GR 2.

LATE AND ADDITIONAL REPORTS

W7AFT is keeping schedules with W7ALM and VE4FR. Traffic: W7AFT 14.

WOUFF HONG TROPHY TO BE AWARDED AT SACRAMENTO

The Modesto Amateur Radio Club announces its decision to resume the policy of the former Modesto Club in making the annual award of the Wouff Hong Trophy at Pacific Division A.R.R.L. Conventions. This famous trophy again will be awarded this year, at the Sacramento Convention in October. It will go to the station adjudged the "best all-around amateur station in the Pacific Division entering the competition."

The award will be made on the following four points:

1. DX, in miles per watt (maximum)..... 35%
2. Maximum traffic handled..... 25%
3. Operating ability..... 20%
4. Percentage apparatus home-made..... 20%

Logs, message files, photographs, or other material, describing the station and submitted in proof of its work, ability of the operator, etc., must be submitted at once to the Secretary-Treasurer of the M.A.R.C., Mr. S. J. Felia, Jr., W6QA, 1117 Eleventh St., Modesto, Calif.

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Prepared by Official Examining Officer

The author, G. E. Sterling, is Radio Inspector and Examining Officer, Radio Division, U. S. Dept. of Commerce. The book has been edited in detail by Robert S. Kruse, for five years Technical Editor of *QST*, the Magazine of the American Radio Relay League, now Radio Consultant. Many other experts assisted them.

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Being pretty much a "DX Hound" myself, naturally I became very interested, but have different views from the author's. In the first place, he mentions that it should be a punishable offense to call "CQ" from this country after one hour before sunset and for at least one hour after sunrise in the morning. Quoting from the article, "Why clutter the air with such trash and make international QSO impossible? There can be plenty of inter-U. S. A. QSO's during daylight hours if 40 and 20 meters are to be used, and the traffic handler still has the 80 meter band for this work after dark."

Very true, but myself with thousands of others get home from our daily work at sundown and go to work about sun-up or shortly after. Possibly the author does not have to work and can have his inter-U. S. A. QSO's during the day. All the interference that shows itself up is from raw a.c. and terrible r.a.c. signals, and if these can be harnessed and made d.c. or xtal-controlled the "DX" will come through just the same, and also be workable.

The fact is appreciated if no one CQ'd more foreigners would possibly be heard, but we OM's that work for a living all day and come home in the evening have to CQ once in a while. And then not every Amateur has BPL ambitions. Any number of us fellows are eligible to become members of the RCC.

— Elmer F. Koehler, W9BEU-BAX

I.A.R.U. News

(Continued from page 66)

few dozen stations. Summertime has other attractions than the ham shack!

On the 3.5-mc. band both receiving and transmitting conditions were very bad, much worse than two or three years ago. No DX work has been reported, the best contacts being those made with South Russian stations — in spite of their using the old intermediates. We are glad to see that our German amateur friends do not like to work those "old-timers" any more either.

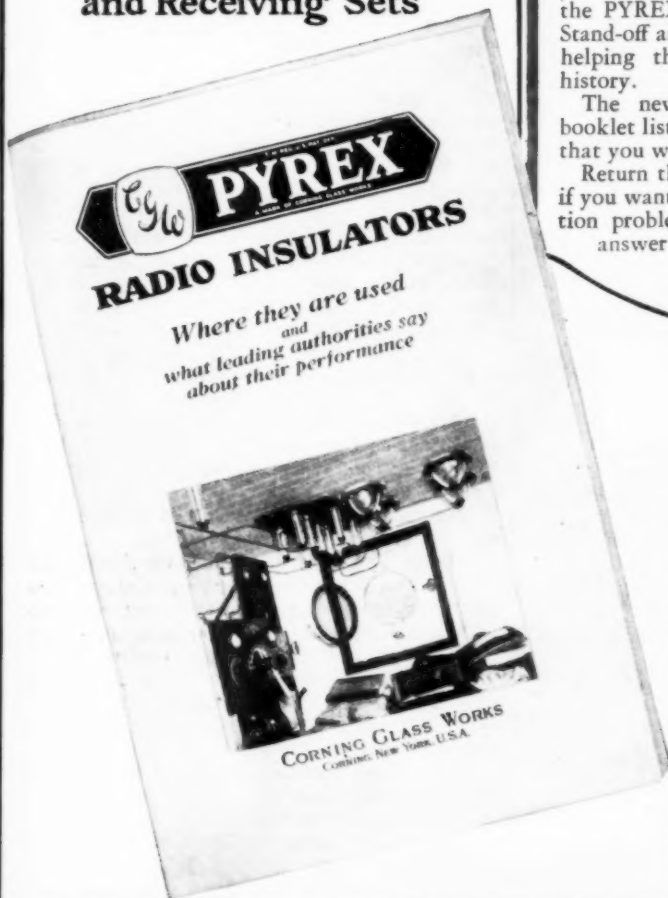
On 14 mc. only PA0DW and PA0ZK reported DX contact. Both worked several North and South American stations, while PA0DW worked one VK and two PK's in addition. On May 25th to 29th conditions for communication in Western directions (W1, 2, 3 and 8) were fair. It is a curious thing that every twenty-six days a relatively short period comes with good possibilities for working American stations. The next period will be September 9th, and so on. We beg those hams who are interested in this subject to write PA0ZK; reports on reception from the European West coast and the U. S. East coast stations are very welcome.

No 28-mc. reports have been received.

Amateurs of The Hague are preparing enthusiastically for a radio fox hunt. A portable transmitter will be hidden somewhere, and the gang will try to locate it by means of direction-finding receivers. Several elections have been held at the club meetings, and many portables have

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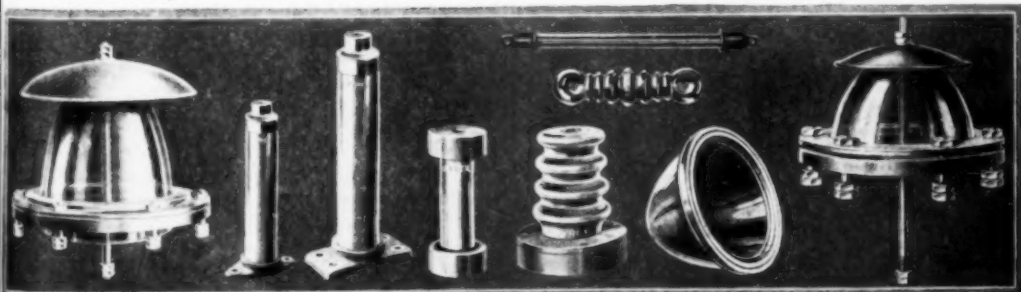
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By **JAMES A. MOYER**

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and **JOHN F. WOSTREL**

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THESE three books embody not only a thorough home-study course, but a ready means of reference for the experienced radiotician. Step-by-step information is given on wiring, "trouble-shooting" installation and servicing to get the best tone quality, distance and selectivity in broadcast reception in all types of sets.

Practical data is given on radio equipment such as antenna systems, battery eliminators, loud speakers, chargers, vacuum tubes, etc., etc.

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been built. It is an ideal job for summer work. We understand that our Southern District gang are likewise planning a hunt. We hope to have some reports on this for next month.

GERMAN NOTES

By Dr. Curt Lamm, D4AFA

The outstanding event of the period covered by this report was our Fifth Annual Convention, held at Halle a/S. on June 7-9, 1930. About 80 amateurs from all over the country gathered at what may be called a very successful and enjoyable meeting.

The convention opened with an address by our President, Colonel Fulda, and letters and wires of congratulation from many foreign sections of the Union, as well as from special foreign friends of ours, were read amid frantic applause. May we once more express our heartfelt thanks to all fellow-societies and amateurs who so kindly thought of us during this festival occasion?

On Sunday, June 8th, the business meeting took place, with results to be detailed below. On Monday, June 9th, two exceedingly interesting lectures were given. Professor Wigge of the institute of technology of high frequency currents at Koethen spoke on infra-red rays and their possibilities in regard to telephone communication over short distances, especially through dense fog, with a view to improving safety on ships and aeroplanes. A very excellent demonstration was given that showed clearly the behaviour of these frequencies, and very fine telephony was produced.

The second lecture, also with demonstrations and experiments, was given by Rolf Wigand of Berlin on the subject of modern circuits. It was shown that a small crystal-controlled valve is capable of controlling directly the final stage in a high-power amateur transmitter, at a power ratio as great as 1 to 50. Experiments showed that it was easily possible to control a 500-watt tube by a small c.e. 10-watt oscillator, not only with telegraphy but also when using telephony (with 100% modulation obtained by using the Ross A. Hull modification of the Heising circuit). It is hoped that some informative data on these circuits will soon be available for publication.

The Constitution of the D. A. S. D. has been changed to some extent, and a new council elected, as follows: President, Colonel Fulda; Treasury and Home Office, Wolfgang Rach (D4ADF); Foreign Office, Dr. Curt Lamm (D4AFA); Editor of CQ, Joseph Brey (D4KZA); Manager QSL-Section, Kurt Schlupp (D4ADC); Technical Information Bureau, Julius Kron (D4SAR), Rolf Wigand, Ernst Reiffen; Representative of D.F.T.V., Dr. Paul Gehne.

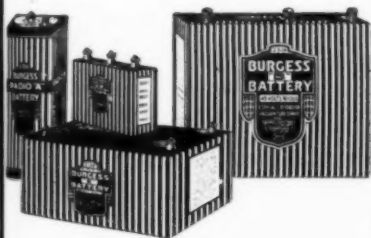
In addition, all district managers in this country and in Austria and Jugo-Slavia now belong to the general council.

We are pleased to state that our Jugo-Slavian fellow-amateurs have as a whole become affiliated with the D.A.S.D., and will in the future be represented in Union matters by this section, as



H. W. Wells, radio operator, and the two Punan Dyaks who made the trip to the head waters of the Murung River with the All-American Lyric Malaysian Expedition.

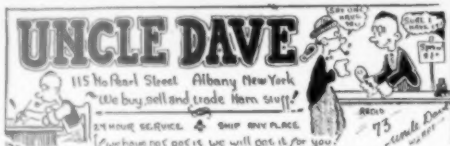
In Borneo too...



Take notice, Hams, of the A. R. R. L. banner—and the Burgess Battery over in the wilds of Borneo, with the All-American Lyric Malaysian Expedition. The only comment was, "If my next expedition is radio equipped I plan on calling on Burgess Batteries."

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General Radio Stand off insulators \$1.10 each. \$1.00 a dozen.	
Calibrated Monitors, built for three uses: Oscillator, Monitor and frequency meter. These are individually calibrated and are checked against Piezo oscillators, net \$9.35 with batteries and three coils for 20, 40, 80 meters.	
Wave meters for 20, 40 and 80 meter band with individual charts, complete with external loop, indicator and coils	\$6.25
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Dongan power transformers, 300 watt 1000 volt each side of center and with following voltages: 3 C.T. 10 C.T. and 10 and 20 volt not C.T. Fully mounted. Weight 14 pounds.	5.95
Ward Leonard 10,000 ohm 50 watt trans. leaks	.50
5000 ohm leaks	.39
New Universal double button microphones, model BB, net	16.50
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All size cabinets and panels upon request	
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New CeCo 230 2 volt 199 type. Non microphonic	1.25
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U. S. Navy 5 watters CG 1162, new	.65
Thordarson double button microphone transformers	5.70
Peerless 12" dynamic auditorium speakers, latest type, low impedance 110 volt D.C.	11.95
Two transformers for changing above to A.C., extra	3.00
Sangamo .00325, .0005, .001, .002, 5000 volt condensers	1.20
Pyrex 7 1/2 inch insulators	1.95
R.E.L. 40 and 80 meter inductances with rods, pair	7.00
Thordarson 150 watt 400 volt C.T. 5 volt C.T.	3.00
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Two Mercury arc outfits, Each	\$25.00 and \$28.00
Three wire shielded cable, Per ft.	.20
Three wire plug and receptacle for above cable, pair	.90
Standard clarostat 0-5 megohm	.85
R.F. chokes for receiver and transmitter	.50
50 watt sockets	1.40
Kenotron type KM 1, Filament 10 volts 100 watts rectify 10,000 volts at 2 amps. One pair only	40.00
Power crystals, anywhere in the 3500 k.c. band	5.25
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has been done during the past year for our Austrian brothers.

All QSL cards for Jugo-Slavian (Jugoslavian) amateurs should now be sent to the D.A.S.D., Berlin. Foreign QSL-managers please note.

Foreign amateurs visiting Germany are requested to get in touch with the D.A.S.D., Berlin W. 57, Blumenthalstrasse 19 (Tel. Kur-fuerst 5773) or, when coming from overseas via Hamburg, please advise the Hamburg District Manager: Dr. R. Wohlstadt, Hamburg 5, Lü-becker Tor 22 (Tel. Alster 1385). We hope to see many of our foreign friends during their vacations, and are only too pleased to be able to show them around.

POLISH REPORT

From the Lwowski Klub Krótkofalowców

The increased activity shown by the L.K.K. during the years 1928-29 was followed by a pause due to a long series of holidays. In spite of the unfavorable circumstances, the Polish hams did not remain idle, and a remarkable amount of DX work was done.

During October, 1929, the annual assembly of the L.K.K. convened, and the following amateurs were placed upon the managing committee for the year 1930: Eng. A. Abenberger, SP3DX, President; Lt. S. Komarnicki, SP3CG, and Dr. T. Vrabetz, SP3DR. Vice Presidents: J. Ziem-bicki, SP3AR, Secretary; K. Kulawik, SP3LV, Treasurer; A. Ligeza, SP3FY, Press Correspondent; Z. Bartz, SP3FS, Editor of "Krotko-falowiec Polski."

The general assembly, besides taking care of many routine affairs, decided to arrange the first high-frequency radio exposition in Poland. Extensive preparations were made for the exhibition, which opened on February 9, 1930, in the rooms of Industry Museum, in Lwow. Splendidly prepared with the coöperation of the most eminent Polish amateurs and radio firms, together with the army and the police, the exposition formed the finest enterprise of that sort and scope held in Europe, and enjoyed a great success.

Another event in February was a ball arranged by our Club and held in a special high-frequency frame and humour.

In April, 1930, an extraordinary general assembly dedicated to the activity according to this year's program, was called together. A considerable development in our membership has taken place, and we now number more than 200 amateurs as members.

The activity of our amateurs is on a parallel with that of the Club. A great deal of DX work is done, especially in the vicinity of Lwow. In this town there are thirty-five stations who reach into all parts of Europe; eight of them have communicated with New Zealand. Special attention is given by the amateurs of Lwow and Poznan to the 14-mc band. SP3AR, SP3KX, SP3AV and others work on 28-mc. SP3AR has worked both Africa and Europe on this band.

A great number of new WAC members in our

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UV-845

A modulator tube available for amateur phone transmission. Also an excellent Audio Frequency Power Amplifier.



Designed with characteristics especially suited for modulator service, Radiotron UV-845 is capable of effectively modulating a far greater amount of oscillator input power than any other Radiotron widely used by amateurs.

The high modulating ability of the UV-845, with its freedom from distortion, will greatly assist the amateur in establishing high quality phone transmission, and will be a source of keen satisfaction to him.

Filament Volts	10	Plate Current (m.a.)	75
Filament Amperes	3.25	Plate Resistance (ohms)	2100
Normal Plate Volts	1000	Amplification Factor	5
Normal Grid Bias Volts	-150	Max. Plate Dissipation (watts) .	75
Oscillator Input Watts for each UV-845 (Mod. Factor 0.6)	120		

PRICE, \$33.70

We invite the amateur to write us for prices and characteristics of other types in which he is interested.

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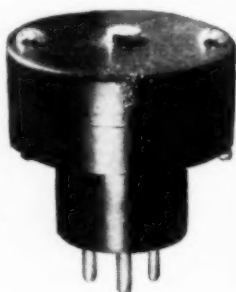
MODEL S-1. Single

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MODEL S-a. Twin

Double mounting on UX base. For quick change of crystals by means of panel mounting switch.

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Frequency stated to within one tenth of one per cent. Maximum power.

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PRODUCTS THAT ENDURE

Club resulted during the winter season. Among these is the first Polish YL, SP1YL of Poznan (formerly SP3YL).

Contact has been established between China, Ceylon, British colonies in Africa, Equator a.s.o. and Polish stations. Communication with the United States and New Zealand is carried on in the 7-mc. band.

SWISS REPORT

(By W. Niederer, HB9G, Member U.S.K.A.)

High-frequency amateur radio is enjoying good progress in Switzerland. There are ten licensed amateurs actively on the air, using the following official calls: HB9B, 9C, 9D, 9E, 9F, 9G, 9H, 9K, 9L, and 9M. In a short time more amateurs will get their Radiotelegraphy Patents and their station licenses, both issued by the Swiss Telegraph Director at Berne.

Some unlicensed amateurs are now looking forward to being licensed and becoming members of the U.S.K.A. We note that during one year's activity of our organization more progress has been made than in the many years before. The number of licensed amateurs has been raised from five to ten, and the number of official receiving stations from 50 to 100. Conferences on the reduction of taxes on transmitting licenses are now in progress. The U.S.K.A. is also endeavouring to broaden its influence concerning the preparation of new amateurs for their examinations.

HB9G, our Traffic Manager in Lausanne, has worked all continents with a maximum input of 15 watts. He has been issued the first WAC certificate in Switzerland. HB9K is a newcomer on 14 mc. and is on the lookout for good DX, having been QSO with a W1.

The U.S.K.A. is planning to organize tests on 3.5 mc., as that band is little used here, but is probably the solution for many problems in our little territory with high mountains and deep valleys. 3.5 mc. is expected to be the best band for local Swiss traffic. Perhaps our 50-watt stations HB9D and HB9H will also work DX on 3.5 mc. Please look out for them.

With IPH in Mexico

(Continued from page 20)

coast for shipment in galleons to Spain. Its condition today could be well imagined. The storms over the succeeding centuries have left but a vestige of a road. Even in those days their great high-wheeled wagons were hauled by scores of oxen.

The two cars that undertook the passage progressed but three miles from sunup to sundown the first day. The grade out of the first canyon was 43 per cent, and block and tackle were used for 400 yards, with oxen holding the car on the road so that it would not disappear with its driver into oblivion in the abyss beneath. Three

BARGAINS ARMY AND NAVY RADIO SURPLUS



Condensers, Mica, operate volts 12,500 cap. .004 Mfd. Wire-
less Specialty—New..... **\$12.50**



AT LAST—Genuine Western Electric Hand Microphone Home Broadcaster. \$3.50 used, \$5.00 new.

Condensers, Dubilier, mica, ap, volts 8500. .004 Mfd..... **\$10.00**

Air compressors, Kellogg, Model T, 1 1/4 cu. ft. per min., weight 6 lbs., 600 R.P.M., 125-lb. Requires 1/4 h.p. **\$3.00**

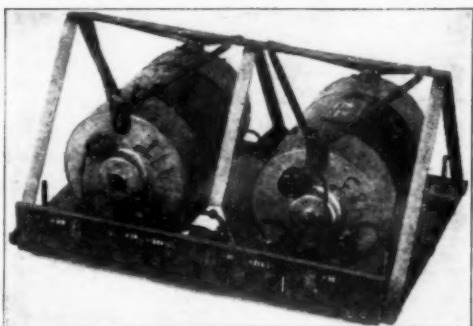
SPECIAL — U. S. Army instruction book on telephony or telegraphy. Hundreds of pictures and diagrams..... **\$1.00**

NAVY Dynamotors General Electric 24/1500 volt, 233 mls. (Extended Shaft — \$3.00 extra)..... \$37.50

New spare armatures, G.E. 24/1500 volts..... **\$12.50**

Generator, airplane, Signal corps, with shaft, can be used as motor, 12 volt, 33.6 amps, 5000 R.P.M..... **\$10.00**

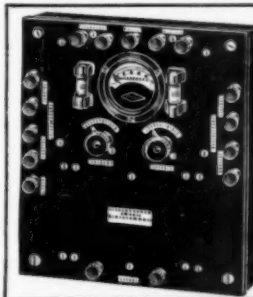
Generators, 12 volt, 60 amp, has automatic controls..... **\$20.00**



Western Electric Dynamotor System No. C.W. 927. Two 27/350 volt dynamotors in shock-proof hanger. May be used in parallel to give 160 mls at 350 volts, or in series, giving 80 mls at 700 volts. Can be used to operate transmitters up to 50 watts power from 32 volt D.C. mains. Ideal for Delco systems.

TWO dynamotors in hanger \$15

Single Dynamotor without hanger \$9

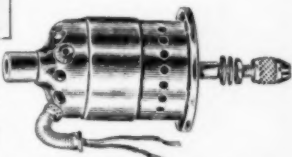


Western Electric Switchboard C.W. 928. Control board for Dynamotor System C.W. 927. Consists of starting switches, fuses, 0-50-500 volt voltmeter with switches for testing main lines and output. Also contains complete filter system. Very special

\$8.00



Magnavox anti-noise microphone, good for home broadcasting..... **\$1.50**



Portable Hi-speed Universal Hamilton-Beach Drill, takes up to 1/4 in. Complete with Chuck, Buff and Grind Attachment..... \$7.50

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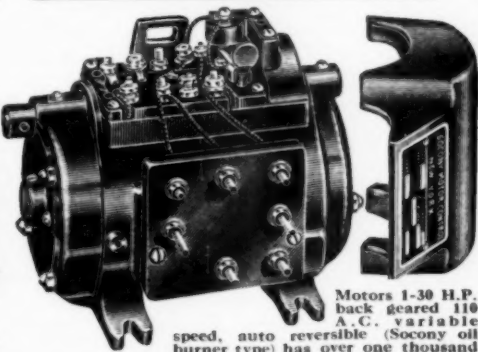
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days were required for the passage of 16 miles. The party ran out of water and food and, when Magdalena was reached, were unable to talk.

On other stretches of road, when the five cars were together, we had to traverse solid masses of boulders for scores of miles. The frames of the cars were twisted into such shapes that the tip of a front fender would become imbedded so deep in the tire that progress was halted until the car could be lifted from its predicament. My car at one time was three feet off the ground with all four wheels. Occasionally a tie rod would bend double and the front wheels turn out in opposite directions. A rope fastened to the car ahead would pull the rod out straight again. Many of the shock absorbers had to be removed, as the abnormal twisting would pull the arm down and throw it back on the other side, thus reversing the action. It was inconceivable to any of us that a piece of machinery could hold together under such treatment. The average speed for the expedition from Los Angeles to Mexico City, a distance of 2280 miles, was 11.4 m.p.h.

The electrical equipment and installations in Mexico, for the most part, are far from modern. The nation's telephone and telegraph wires that paralleled our course for many miles were supported by old tree trunks; then the mode would change and old railroad rails would serve the purpose. One span of wires I noted is indeed primitive. A native had stolen the copper wires between these poles, and the repairmen later had completed the circuits with barbed wire from the nearest ranch fence.

Apparently no underground cables are used in Mexico City. Telephone poles are mounted on the roofs of buildings, with twelve or fifteen cross-arms and wires but a few inches apart. A shotgun fired into this mess would ruin the communication system for years.

QSY with Crystal Control

(Continued from page 32)

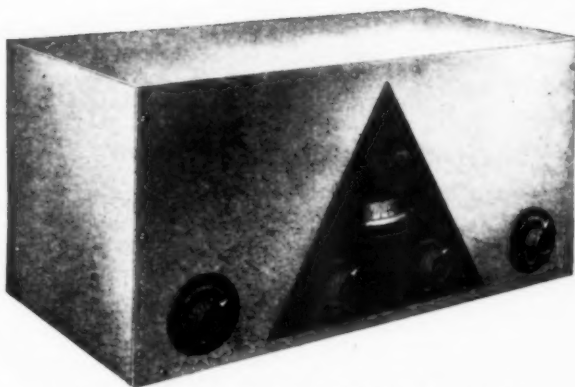
should be performed without taking the piece out of the chuck. Getting the bottom inside face as near optically flat as possible is aided by making a small depression in the middle. This does not affect the operation materially. A moat is cut around the edge of this surface to keep the crystal corners from climbing up the otherwise curved fillet and to prevent breakage of the crystal when the top plate is screwed down tight on it in such position. A threaded plug is made from a brass ring with a hole in it and covered with a piece of bakelite in the middle of which the top electrode is mounted. The face of this electrode is finished when the thread is cut so as to insure both faces of the electrodes being parallel when screwed together. This holder may be dressed up with a big knurled top of bakelite or polished and lacquered metal and a pointer bent around from under one of the cover screws to read exact frequency on a scale attached to the side of the holder; or the edge of the cover (brass or bakelite

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2. Uniform high selectivity
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4. Sensitivity or range

1. Cannot be improved without loss of flexibility. It now consists of single control tuning plus a volume control.
2. Is adequate for normal demands but it can be increased with some sacrifice of tone and considerable expense.
3. Can be changed. We can alter the tone but it needs no improvement. Of course we also can increase volume tremendously by added audio and its attendant expense.
4. The sensitivity is high and meets better than normal requirements. It can be increased, but not with large advantage, and an increase comes with large expense.

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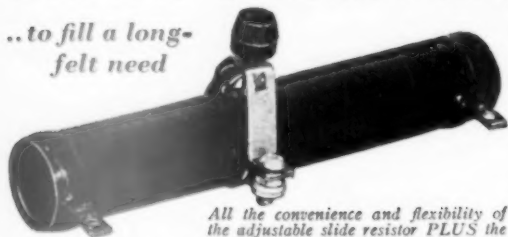


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part) may extend through a slot in a vertical panel or be remotely turned.

Another holder easier to make from odds and ends around a ham shop and with common tools is shown in Fig. 3. The bottom plate is flat brass lapped on a piece of plate glass as a crystal would

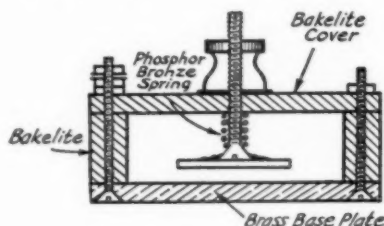


FIG. 3

be ground, preferably after all other work on the plate is finished. A 2" square piece of 1/2" thick bakelite (or thinner pieces stacked in a pile at least 1/2" high) forms the sides of the holder and another piece of 2" square bakelite forms the cover and the whole assembly is screwed together. Some patience may be needed in soldering the top electrode to the flat head brass machine screw so it will be parallel to the crystal when assembled but from the way screws are made a new screw lightly rubbed on emery paper spread flat to just take off burrs will probably have a head that is very close to perpendicular to the axis of the thread. A thumb nut on the thread extending through the cover gives the adjustment and pulls against a small coiled spring between the upper electrode and cover. A pointer may be soldered to the knurled adjusting nut to read on a circle scratched on the bakelite cover. If the cover has been sanded to remove its gloss it will show pencil marked calibrations nicely.

It is believed the general description and the two figures illustrate the idea with considerable leeway left for individual ingenuity and improvement. This gadget is the best answer to the criticism of not being able to QSY on account of crystal control and gives the effect of having a "rubber crystal." Practically no valid arguments now remain for everybody not using crystal control.

Making Practical Use of the 56-Mc. Band

(Continued from page 16)

greatly different thrills. Our pet ambition, at present, is to QSO on phone with W2EB on Long Island, and if we do we will need another band down around one meter again, because every phone on "80" at the present time will be down on "5" within a year. (We can see the code gang on 80 getting a medal or something ready for us if we do.)

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Experimenters' Section

(Continued from page 50)

grounded. Check the house wiring and see that all 110-volt lines are properly covered and grounded as required by the Fire Underwriter's code. The filament transformer should be encased and the case grounded. Lack of such shielding is probably the cause of more a.c. hum in receivers than any other.

7. The a.c. switch mounted near the receiver can cause plenty of hum. See that it is an enclosed type with the cover grounded to the line covering.

8. Try disconnecting any appliances that may be in use, such as your Frigidaire, iron, etc.

9. There are very few "B" eliminators on the market that can be worked successfully with a.c. short-wave receivers. One of the best is an old Philco with the cover grounded. If you are in doubt, check the set with "B" batteries.

10. Filaments of the tubes should be connected in series, and should have no electrical connection to any part of the receiver, excepting the center-tapped resistor, which in turn is connected to ground.

11. Make sure that all ground connections are common to the same ground.

12. By the proper combinations of the above suggestions you can get rid of all hum that may be present in your receiver, provided of course the trouble is not in the receiver itself.

A Potential Divider for Use at Radio Frequencies

By Don Hale*

In testing r.f. amplifiers or in research work with tubes or circuits it is often necessary that a source of small, high-frequency voltages be available. The ordinary potentiometer devices will not serve. As an example, suppose an amplifier capable of giving a voltage amplification of one million at a frequency of 500 kc. is being tested. Suppose also that a detector tube is being used in the output circuit that cannot have a grid swing or more than twenty volts without giving serious distortion. Under conditions such as these it would be necessary that the input voltage be kept below twenty micro-volts.

It is easy to construct a device that will give these small voltages at high frequencies.¹ Fig. 5

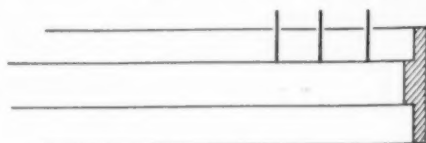


FIG. 5.

shows the appearance of this piece of apparatus, which can be constructed by any machinist. It consists of two concentric brass tubes joined at one end by a brass plug. The plug is carefully sweated into place, making a strong mechanical

* University of Nebraska, Lincoln, Nebr.

¹ Hull, Physical Review, Vol. 25, Series 2.

Two Way Radio Link Never Interrupted — Capt. Yancey's Radio Makes New Records —

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joint as well as good electrical contact. The inner tube is drilled and tapped at regular intervals from the plug. There is a small hole in the outer tube corresponding to each tapped hole in the inner tube. Small wires are threaded and screwed into the inner tube and project through the outer one.

Fig. 6 shows the method of connecting this device to the input circuit. The brass plug closing the tubes is soldered to the shield of the first stage, and the grid of the first tube connected to one of the projecting wires. In use with a circuit having antenna and ground connections the



FIG. 6.

ground connection can be joined to the brass plug and the antenna connection to the projecting wire. The alternating current is led through a thermo-junction and connection made to the inner and the outer tube at the open end. A galvanometer is connected across the thermo junction. The thermo-junction-galvanometer combination is calibrated and a curve drawn up showing the deflection given by a chosen number of milliamperes d.c.

At Brace Laboratory, University of Nebraska, one of these dividers is in use in connection with a Western Electric type 20K thermo-junction and a Leeds and Northrup wall galvanometer. A direct current of 0.2 milliamperes gives a deflection of 45 millimeters with this combination. The outer tube in the divider is 5 cm. in inside diameter and the inner tube 2.5 cm. in outside diameter. Each tube is 30 cm. long, and the taps are brought out over 3 cm. The walls of both tubes are 0.4 cm. thick.

The self-inductance of the inner tube is

$$L = 2 \log_e R/r \text{ per centimeter length.}$$

R is the inner radius of the larger tube and r is the outer radius of the inner tube. This value of L is measured in the electromagnetic system. Converting this value to henrys

$$L = 2 \log_{10} R/r \times .0045 \times 10^{-6} \text{ per cm.}$$

The voltage impressed upon the grid of the first tube is

$$E = 2 \log_{10} R/r \times .0045 \times 10^{-6} \times \text{vol.}$$

In the derivation of these equations the current is assumed to flow only on the surfaces of the tubes. This is not quite true, but at radio frequencies the error caused by this assumption is less than one per cent.

Considering the case mentioned above, that is when the current is 0.2 milliamperes and the frequency is 500,000,

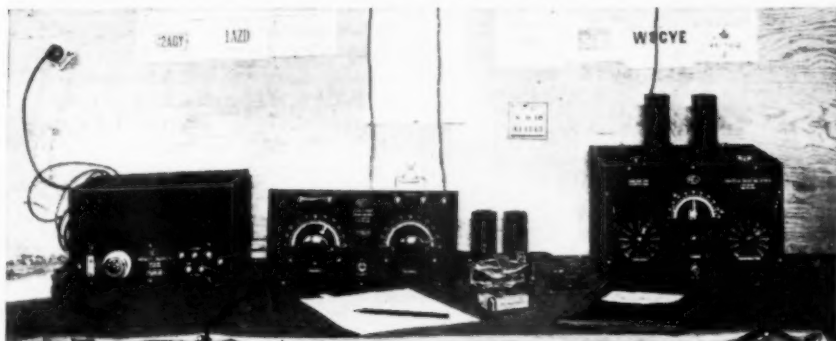
$$E = 2 \log_{10} \frac{5}{2.5} \times .0045 \times .0002 \times 2\pi 500000 \times 10^{-6}.$$

This gives a value for E of 1.7 micro-volts per centimeter measured along the inner tube from

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1711 PARK STREET

QST

HARTFORD, CONN.

Say You Saw It in *QST* — It Identifies You and Helps *QST*

Qualify for that Land Station Job in a few weeks!

Send 35 wpm or more with less effort than you now send 10. Increase receiving speed from 10 wpm to 30 or 35. Double your typing speed. *It's easy!*

The Candler System of High-Speed Telegraph- ing Shows How

The Candler System is a system of Physical and Mental Co-ordinative Training for Radio and Morse Operators who want to acquire skill and speed in sending, receiving and writing with pen and typewriter. It relieves and prevents cramps and paralysis and makes the arm strong and fast for both hand and machine sending. Develops the power of **Concentration**. Gives you **Confidence** by making you sure of yourself at all times. Qualifies you to work any Morse or Wireless job.



Walter H. Candler
Former World's
Champion Operator
and Originator of
The Candler
System will in-
struct you personally
throughout the Course.

What Operators Say

These letters are typical of thousands in our files praising The Candler System. "I owe my speed 55 wpm to your System." (Theo. McElroy, World's Champion Radio Operator, Boston.) "Improved 100% in two weeks after beginning The Candler System." (Frederic Giesler, U. S. Airdrome, Dryden, Texas.)

Write for FREE particulars

If you really want to increase your speed and qualify for that land station job in the shortest possible time and with the least effort to yourself, write at once, for **FREE** particulars of The Candler System of High-Speed Telegraphing. Give present speed (Morse and Continental.) No obligation. Write NOW!

THE CANDLER SYSTEM CO.

Dept. R. L.

6343 South Kedzie Avenue CHICAGO, ILLINOIS

RECTOBULBS

Type R3 for the transmitter: Mercury Vapor Hot Cathode, indirectly heated; standard filament voltage of 10 volts; durable and trouble free when used within specified limits:

Plate voltage.....	3000
Filament volts.....	10
Maximum Plate load (Mils)...	250
Inverse peak maximum.....	7000
Drop per tube 15 volts at full load	

Type R81 to replace standard UX281 Rectifier tubes: a wonder for the heavy duty amplifier and small transmitter.

Plate volts.....	750
Filament volts.....	7.5
Plate mils.....	150
Drop per tube 10 volts full load.	

Specialists on Tube Reconditioning. We invite you to use our Service.

Try our N65 Screen Grid Buffer and Amplifier tube.

Priced low for the Ham \$12.50

*All products and reconditioning fully
guaranteed against defects*

NATIONAL RADIO TUBE CO.

3420 18th Street

San Francisco, Calif.

the closed end. Since the thermo-junction-galvanometer combination is calibrated with d.c. this is an r.m.s. value of voltage.

W9BAN

(Continued from page 34)

Messages, QSL's, correspondence, etc., are filed here. Further left is the station's book shelf with the ever-present *Handbook*, atlas, call book, radio manual and the latest issues of *QST*. To the right of the switch panel is the Vibroplex.

A special lead weight was made for the "bug" so that it could be used at slow speeds, and gives a range of from 13 to 28 words per minute, which seems to be satisfactory for all amateur contacts. The molded lead weight is cylindrical in shape, one inch long and $\frac{7}{8}$ inches in diameter. By having the hole bored accurately no set screw was needed. This facilitated matters greatly, in that it is only necessary to push the weight up or back to vary the speed, the operation taking only a second. The rubber feet of the Vibroplex are moistened and the instrument pressed firmly in place on the table. This prevents any slipping of the "bug" during operation. Two hand manipulated keys are mounted on the table at the left in front of the transmitter, though they are seldom used.

The motto of W9BAN was "See America First," and with that in mind every state in the Union was worked. And one might say that the first forty-five are the easiest. The best DX is New Zealand, with Hawaii, Europe, South America and others in the string. A log is kept of all transmissions, and incidentally, the headings in the log books were disregarded and information was recorded in the same order as the printed headings of the station call card, to facilitate filling out a QSL. A simple four-tube broadcast receiver, with headphones, is occasionally used to fill in the "off" nights. The entire station is home-constructed.

W9BAN holds appointments as Official Broadcast Station and Official Relay Station. Although the monthly total is not high, message traffic is always welcome and is handled as speedily as possible. And next to "traffic" . . . well, the station is a full-fledged member of Ye Rag Chewer's Club.

Election Notices

(Continued from page 39)

standing. The nominee must be a League member in good standing and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of November, 1930. There is no limit on the number of petitions that may be filed, but no member shall append his signature to more than one such petition.

4. Present Directors from these Divisions are as follows: Central, Mr. D. J. Angus, W9CYQ,

QST Oscillating Crystals

"THE STANDARD OF COMPARISON"

AMATEUR BANDS:

Winter is coming, and no doubt you are going over your transmitter removing those weak links so as to get the most possible efficiency from your set.

One item of great importance is the *frequency stability* of your set. Does it *stay on one frequency*? If not, our *power crystals* will solve that problem. SCIENTIFIC RADIO SERVICE crystals are *known* to be the best obtainable, having ONE single frequency and highest output. With each crystal is furnished an accurate calibration guaranteed to *better than a tenth of 1%.* New prices for grinding *power crystals* in the *amateur bands* are as follows:

1715 to 2000 Kc band. \$15.00 (unmounted)
3500 to 4000 Kc band. \$20.00 (unmounted)
7000 to 7300 Kc band. \$40.00 (unmounted)

BROADCAST BAND:

Power crystals ground in the 550-1500 Kc band accurate to plus or minus 500 cycles of your specified frequency fully mounted for \$55.00. In ordering please specify type tube, plate voltage and operating

temperature. All crystals absolutely guaranteed regards to output and frequency and delivery can be made within two days after receipt of your order.

CONSTANT TEMPERATURE HEATER UNITS:

We can supply heater units guaranteed to keep the temperature of the crystals constant to *better* than a tenth of 1 degree centigrade for \$300.00. Two matched crystals, ground to your assigned frequency in the 550-1500 Kc band with the heater unit complete \$410.00. More detailed description of this unit sent upon request.

ATTENTION AIRCRAFT AND COMMERCIAL RADIO CORPORATIONS:

We invite your inquiries regards your crystal needs for Radio use. We will be glad to quote special prices for *POWER* crystals in quantity lots. We have been grinding *power* crystals for over *seven years*, being *pioneers* in this specialized field, we feel we can be of real service to you. We can grind *power crystals* to your specified frequency accurate to plus or minus .03%. All crystals guaranteed and prompt deliveries can be made. A *trial* will convince you.

SCIENTIFIC RADIO SERVICE

"THE CRYSTAL SPECIALISTS"

P. O. Box 86

Dept. P-12

Mount Rainier, Maryland

TRANSMITTERS

7½ watt T.P.T.G. Single Control, \$20. Husky filtered 281 type power, \$18. 15 to 30 watt Tuned Grid, Tuned Plate, uses two 10 tubes in parallel, \$24. Oversize 281 power, filtered, \$20. Both sets absolutely give steady, pure DC notes, neatly built. Preference given to buyers of set and power.

Write for complete description

HAL S. JUSTICE, WATTS, Box 552, Canton, N. C.

Did you send for a copy of our latest
RADIO BARGAIN BULLETIN No. 31?

Full of "Ham" Buys

AMERICAN SALES COMPANY

19-21 Warren Street

New York City

ATTENTION!

Special Sale

PHOTOPHONE



12" DYNAMIC SPEAKERS

Regular List Price \$110.00

OUR PRICE \$15.00 WHILE THEY LAST

BRAND NEW IN ORIGINAL CASES. RUSH YOUR ORDERS!

Field Supply
110 V.D.C.

Field Supply for adaptation to A. C.
operation \$6.50 additional

Terms:—25% with order—Balance C.O.D. or Sight Draft. Specify Express or Freight

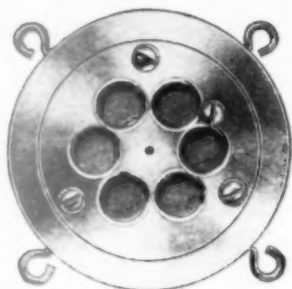
RAYMOND ROSEN & CO., INC.

117 North 7th Street

Sound Amplification Division

Philadelphia, Pa.

Model
B



Make your phone set sound like a professional

Remember our old Mike with the three arms?
Model B is even better. List — **\$55.00**

With Filter attachment. List — **\$75.00**

Condenser Mike complete ready to hook up
like a carbon mike. List — **\$375.00**

Condenser units, for replacement, or use with
your own amplifier. List — **\$135.00**

Write for Our Catalogue on
Amplifiers and Microphones

GENERAL INDUSTRIES CORP.
WALTHAM, MASS.

The BETTER Wire-Wound Transmitter Grid Leak —Because QUALITY-BUILT



Superior performance — because it
is built to quality standards — not
to meet any special price level.

Unique construction allows for
winding more wire of a larger
diameter in a small space. Liberally
insulated. Soldering lugs and con-
tact bands of Monel metal — pro-
viding equal expansion and positive
connections. Covered with mois-
ture-proof enamel. Guaranteed not
to develop noise or open circuits.
Three sizes (100, 40, 15 watts) and
ten resistance values, tapped for all
usual needs. \$1.50 to \$5.50.

Write Dept. Q-9 for complete
details

175 Varick Street, New York, N. Y.

ELECTRAD
INC.

Indianapolis, elected in April, 1930, to fill unexpired remainder of term of late Clyde E. Darr; Hudson, Dr. A. Lafayette Walsh, W2BW, New York City; New England, Mr. Frederick Best, W1BIG, Augusta, Me.; Northwestern, Mr. K. W. Weingarten, W7BG, Tacoma; Roanoke, Mr. W. Tredway Gravely, W3BZ, Danville, Va.; Rocky Mountain, Mr. Paul M. Segal, W9EEA, Denver; West Gulf, Mr. Frank M. Corlett, W5ZC, Dallas.

5. These elections are the constitutional opportunity for members to put the man of their choice in office as the representative of their Division. Members are urged to take the initiative and file nominating petitions immediately.

For the Board of Directors:

K. B. WARNER, Secretary.
Hartford, Conn., 1 August 1930.

To all A.R.R.L. Members residing in the MID- WEST DIVISION:

1. Mr. Louis R. Huber, W9DOA, A.R.R.L. Director from the Midwest Division, has resigned as Director because of removal from the Midwest Division, the resignation to take effect upon the election of a successor.

2. You are hereby notified that a special election is about to be held in your Division, in accordance with the Constitution, to elect a successor to Mr. Huber for the unexpired remainder of his 1930-1931 term. This special election will be held in the month of November, 1930, concurrently with the regular elections above notified to occur in certain other Divisions. All of the governing details above notified as applying in other Divisions apply to the special election in the Midwest Division except that the term of office is the remainder of the 1930-1931 term.

3. Nominating petitions, complying with the governing details above referred to, are hereby solicited. The following form for nomination is suggested:

(Place and date)

Executive Committee,
American Radio Relay League,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the Midwest Division, hereby nominate
..... of
as a candidate for Director from this Division for the unexpired remainder of the 1930-1931 term of L. R. Huber.

(Signatures and addresses)

Members are urged to take the initiative and file nominating petitions immediately.

For the Board of Directors:

K. B. WARNER, Secretary
Hartford, Conn., 6 August 1930.

Calls Heard

(Continued from page 57)

w6cf w6cwh w6exp w6cum w6elp w6ewj w6cqs w6cgy
w6cxk w6cbp w6car w6ctz w6cgv w6cgg w6czk w6can
w6cql w6cyx w6cei w6cfn w6chw w6ctk w6cgy w6cgv
w6czx w6crz w6er w6dji w6dzu w6dkx w6dpj w6dgz w6dpl
w6dnw w6dep w6dij w6dio w6dwi w6dtd w6dwi w6dep

IF YOU WANT TO BE
SITTIN' PRETTY—
THEN—USE THE
COMPLETE
THORDARSON
ELECTRIC POWER
SUPPLY—ES YOU'LL
HV A 1930
SIGNAL-OM



THORDARSON ELECTRIC MANUFACTURING CO.
Transformer Specialists Since 1895

Huron, Kingsbury and Larrabee Sts.

Chicago, U. S. A.

THE BEST IS NONE TOO
GOOD FOR YOUR TRANS-
MITTER —
USE THE BEST!

JUST A REMINDER—

WE STILL HAVE AN
AMATEUR LOG BOOK FOR
THE HAM WHO DID NOT
GET ONE OR THE
BEGINNER WHO WANTS
TO KNOW, WHATS IT
ALL ABOUT, SO SEND
IN YOUR OSL CARD OR
LETTER.

IT HAS A LOT OF GOOD
HAM DOPE IN IT
THAT YOU CAN USE.



SIEMENS-ZWIETUSCH High Voltage CONDENSERS

Exceptionally well built—Compact
Very Conservatively Rated
Safe to Use

DC Working Voltage	Mfd	Size	Price
1000	1	2 1/2-1 1/4-2 1/4	\$ 3.75
	2	6 -1 1/4-2 1/4	6.50
	4	4 1/4-2 -6	11.00
1500	1	6 -1 1/4-2 1/4	4.50
	2	4 1/4-2 -6	8.50
	4	4 1/4-4 -6	14.50
2000	1	4 1/4-1 -6	8.75
	2	4 1/4-2 -6	13.50
	4	4 1/4-4 -6	26.00
3000	1	4 1/4-4 -6	20.00

**The
BIGGEST
VALUE
for
Your
MONEY**

Sold by

J. H. BUNNELL & CO.
215 Fulton Street, New York City

LEEDS RADIO CO.
45 Vesey Street, New York City

WIRELESS EGERT

179 Greenwich Street, New York City
and other reliable dealers throughout the country

MORRILL & MORRILL

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U. S. A. Distributors

If you cannot get SIEMENS-ZWIETUSCH con-
densers from your dealer, write us sending your
dealer's name and address.



Get Started in Photo-Electricity — a Fascinating Field!

The exceptional performance of the Arcturus Photolytic Cell has already been proved on Sound Picture Equipment; Sorting, Checking and Matching Equipment; Railway Signal Systems; and many other devices.

Other applications are sure to be worked out. Perhaps you will be the one to discover a new use for this improved cell. Send today for complete information, and start working in a fascinating new field of research. *Photo-Electric Division, Arcturus Radio Tube Co., Newark, N. J.*



MADE BY THE MAKERS OF ARCTURUS BLUE TUBES

The NEW Easy-Working GENUINE MARTIN

VIBROPLEX No. 6

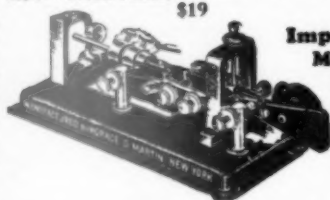
Reg. Trade Marks: Vibroplex; Bug: Lightning Bug

IN COLORS: Blue — Green — Red

10 New features.
Easy to operate.
Easy on the arm. Fast or slow. Transmits signals unequalled for strength, clarity and beauty.
Black or Colored.
\$17 Nickel-Plated.



\$19



Improved
MARTIN
Vibroplex

Black or Colored, \$17
Nickel-Plated, \$19

Special Martin Radio Bug — Extra large, Specially Constructed Contact Points for direct use without relay. Black or Colored, \$25

Your old Vibroplex accepted as part payment
Remit by Money Order or Registered Mail

THE VIBROPLEX COMPANY, Inc.

825 Broadway, New York City
Cable Address: "VIBROPLEX" New York

w6dim w6dam w6dfr w6di A6dpf w6ew w6emk w6eou
w6eoz w6eje w6egb w6egd w6eak w6epf w6edg w6eab
w6ewb w6ea w6hvw w6hy w6im w6io w6qb w6en w6vo w6wa
w6zn w6zzg w7adg w7aat w7amp w7anj w7ajw w7ac w7abx
w7abj w7acy w7an w7afo w7bd w7be w7de w7dl w7fh
w7nr w7el w7ts w7yg w8auc w8axx w8bas w8cyu w8cqp
w8dcq w8dyc w8dnx w8din w8gb w8gm w8wa w8amv w9ae
w9atv w9aak w9aag w9aab w9aks w9bpb w9bgl w9bcs
w9bhw w9bgs w9bqv w9bcx w9cfa w9cef w9cwx w9cub
w9cpm w9cvg w9cmv w9ces w9cph w9cf w9dr w9dzg
w9dhj w9dgs w9dts w9ecz w9egu w9eap w9fqm w9faw
w9fuf w9ghw w9gdv 29la w9oo w9so.

14,000-ke. band

ac1ts au7at au8at ce3cf cm8uf f8ax f8oma g2gm g6vp
hc1fb hc1fg hc2jm j1dp kaldj kalaw kaljr k6acw k6erh
k6ewb lu5ac lu8dy lu9dt oa4j oa4q oa4t oa4a oh2nm on4vu
pk3bm pk3bq pk4pa vk2av vk2cd vk2cs vk2ek vk2hb
vk2hu vk2jp vk2jq vk2lv vk2na. vk2pa vk2ra vk2rf vk2rx
vk3ag, vk3cx vk3es vk3go vk3gu vk3lp vk3pa vk3pp
vk3pr vk3wk vk3wo vk3yr vk3zx vk4jb vk4jr vk4rb
vk4rg vk5gr vk5it vk5wr vk6da. v6ag w1er. w2adp w2ap
w2cjx w6brt w6bab w6chy w6cuh w6dts w7anj w7ty w9faw
w9gdh xu2uu

VE5AW, W. L. Geary, Whitehorse, Yukon,
Canada

ac1ts ac8hm cm8uf d4aar d4aez d4jl d4xn ear21 ear96 f8aw
f8esf f8et f8da f8eo f8ex f8fm f8fr f8gdb f8ha f8hr f8ja
f8yy f8pac g2ao g2gm g2lx g2sa g2ma g5bd g5by g5bz g5yg
g5yk g6dh g6fn g6nh g6nt g6rb g6vp g6wo g6wt g6wy
g6xn g6qa h6lfg ilcoe j2cb kalaf kaldj kalhe kalhr
kalpw k6acw k6alm k6bhl k6boe k6ceu k6dy k6dud k6eqm
k6erh k6etf k6eb k7abm k7abs k7anm k7ans k7anq k7aom
lu2ca lu3dh lu6fc lu8dy lu9dt nn1nic oh2nm oh2ob oh2op
oh2nb oh5nl pa0dw pa0qf pa0tw pa0mm pa0zk pk1jr
pk3bm py1aw py2bk py2bx on4fe on4fm on4ft on4fp on4he
on4jj on4ro on4rs on4uu on4be oz2u oz5a oz7g oz7im oz7j
oz7t oz7y sm6ua sm6wl su8rs ti2rs un7wv u0mm ve5ao
ve5fs vk2hu vk3bl vk4bh vk5gr vk6mo vk7ch vk7dx vq2bh
x9a y1llm y1lan z1lar al1bb zl1fc zl1fw zl2bx zl2gp zl3as
zl2ac zslp zs2n zs4m zs5u zs6w zu6r ei8b haf3b ok1au
ce2ab ce3ab ce3bf lalw rk1kad rkrao3 rkrrpx rkra97 ac7xot
bal lcfh kfzt xing bw sa1ax fx7 wfat wbt wfa ct1aa ct1bx

W1BOD, F. M. Dukot, 57 James St., Hamden,
Conn.

14,000-ke. band

ce2ab ce3ag ce3bf cm2sh cm8uf ct1bx ct2aa cr4ad cxlap
cx2ak d4ec d4jl ear21 ear96 ear116 ei2d ei8b f8aly f8axq
f8es f8da f8ex f8fm f8fr f8gg f8hr f8wba f8wia
f8wrg f8aic g2bm g2kf g5bj g5by g5bz g5ml g5ms g6gs
g6hp g6qb g6vp g6wt g6wy g6za h6lfg hc2je hc2jm k6boe
k6etf kfu5 lu2aa lu3dh lu4bi oa4c oa4j oa4q on4caa on4di
on4fp on4jb on4je on4jj pa0zk py1aa py1el py1cr py2ay
py2bx py2ib py2qb rx1aa sm6wl ys1ap allas allfu zl2bg
zl3as zl3cm wfa wfat

W1CPH, Thomas I. Siglin Jr., 16 Sylran Ave.,
Edgewood, R. I.

w5awp w5bit w5zzo w5aom w5adp w5aea w5abi w5uk
w5brd w5ee w5ja w6ejz w6dmo w6czk w6cuh w6egh w6dww
w6cep w6ajm w6bex w6bek w6dep w6bam w6cxw velco
xvelal ve2bb ve2be ve2ap ve2ca ve3bk ve3cf ve3wk ve3bm
ve3fq ve4bb ve4hc ve4ae ve4al ve9az vo8mc voqh ct1aa
ct1bx ct2ac celah cx2bt cm8yb cm8yb claf ear39 ei8b
f8dr f8mr f9w g2vq g2mc g6rb h6lfg ilcoe k6bed k4kd
kdv5 la1anz nj2pa on4gn py1aw py1er py1ah py1bt py1d
py2ab py2bk py8ia pxmg x2bc ys1x ap2ab wbt wyp wsbu

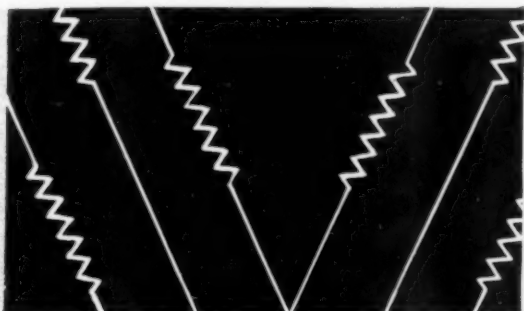
WK2RX, H. C. St. John, 82 Gibbs St., Rockdale,
N. S. W., Australia

14,000-ke. band

w1aef w2rs w2ayj w4aef w4kh w4ly w6abp w6elo w6akf
w8dy1 w8ud w9bmu w9dwn au8at ce5aa ce7na cm8uf ct1aa
ear96 f8at f8es f8da f8ex f8fr f8gm f8gdb f8hr f8lgb fa8bak
g2bm g2dz g2lx g2nh g2od g5by g5is g6ia g6nf g6nt g6qb
g6vp g6wl k6acw k6bhl k6boe k6cpo kaljr lu3de lu3pa
lu6aj oa4j oa4q oa4r oa4t oa4z oh2nm on4jj oz7y pa0qf
su8rs su8wy vs2af vs3ab vs6ae vs6af vs6ag vs6ah vs7ap
vu2ac vu2dg vu2zx xu2uu

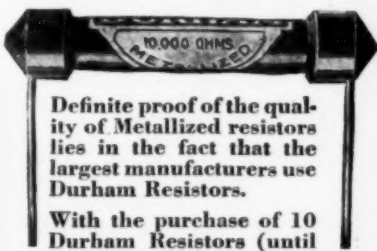
Guard Your Reputation

Metallized resistors are used by the best service men,—conservatively and accurately rated,—will not exceed original tolerance,—notably quiet,—remarkably rugged,—all types,—values from 50 ohms to 10 meg ohms,—prompt deliveries.



DURHAM
metallized
RESISTORS

METALLIZED RESISTORS



Definite proof of the quality of Metallized resistors lies in the fact that the largest manufacturers use Durham Resistors.

With the purchase of 10 Durham Resistors (until October 15th) you receive our complete *Resistor Replacement Guide* free; or you may buy it for 50c.

This remarkable booklet shows service men clearly and concisely: (1) How to locate cause of trouble in radio sets. (2) Proper types and values of resistors to use in all popular types of radio receivers for last 3 years.

Send your order today.

INTERNATIONAL RESISTANCE COMPANY
2006 Chestnut St. Phila., Pa.
"No other Resistor has all of Metallized's Advantages."

QUARTZ OSCILLATING CRYSTALS

Scientifically Prepared for Maximum Power and Unconditionally Guaranteed 1 in. square sections, (close to your specified frequency), supplied promptly at the following prices:

75-100 meters	\$12.50
100-200 meters	9.00
200-600 meters	15.00
1 in. Tested blanks, 200-400, 400-600 meters	4.00
Dustproof Bakelite mounts	3.00

(A Calibration furnished with each crystal)

Sections of any practicable dimensions made to order
(Charges for grinding to exact frequencies given on request)

J. T. Rooney, B. Sc., 4 Calumet Bldg., Buffalo, New York
"A pioneer crystal grinder"

Massachusetts Radio and Telegraph School

18 Boylston Street, Boston
Send for Catalogue

Tel. Hancock 8184 Established 1905

ALCOA ALUMINUM SILVER FINISH PANELS

72c per square foot

Maximum width 12", maximum length 48"
Moulding for corners 12c foot

We carry complete lines of the following —
Aero, National, Thordarson, Flechtheim, Pilot, Frost, Signal, DeForest, Hammarlund, R.E.L., Pyrex, Sangamo, Ellis, Universal, Fleron, Munzig, Magnet wire, Fahnestock clips, Ohmite, Readrite, Cardwell, Bradley, Yaxley, Handbooks, Call books, Bakelite panels and tubing, Jewell.

Everything for the Ham
CATALOG FREE
We pay the postage

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U. S. NAVY SURPLUS

General Electric 24/750-volt 150-watt Dynamotors	\$27.50
General Electric 24/1500-volt 350-watt Dynamotors	37.50
500-watt 500-cycle generators with excitors	7.50
Westinghouse 6-15 volt 500-watt	15.00
Westinghouse 27.5/350-volt 80 mills	12.50
Twins for double voltage or current	20.00

Shatts for external drive \$3.00 additional

HENRY KIENZLE, 591 E. 84th Street, New York
Pioneer Distributor of Government Surplus
Complete list on request

DON'T BANKRUPT Your station using skimpy or salvage stock power equipment. Engineer it with apparatus specifically designed for xmtr rectifier service. Ask for latest engineering data describing power transformers built to QST ratings — double and triple normal load; filter reactors that block the AC, let the DC slip thru, and a brand new reactor 500% more effective than brute force. All insulated for 10 times working voltage. Single and polyphase power equipment for every type of station. Your rectifier problems solved.

Rectifier Engineering Service, 4837 Rockwood Rd., Cleveland, Ohio

H I L E T

Bulletins are complete with regulation curves and engineering data to help in selecting the proper material. WHEN YOU GET A 30 H-160 MA. CHOKE AT-6 lb. someone is being fooled. IT JUST CAN'T BE DONE. Adjustable Gap. Chokes: — 100 H-80 MA, 22 lb. \$12.00, 50 H, 160 MA, 22 lb. \$12.00, 30 H-320 MA, 25 lb. \$14.00, 15 H, 500 MA, 32 lb., \$18.00, 3 H-4000 MA, 22 lb., \$12.00. Transformers 750 watt 1500-1850 each side, \$19.50, 500 watt, 1000-1500 each side, \$15.00, 250 watt 500-750-1000 each side, \$10.50, 150 watt 325-375 each side, \$9.00. Filament any voltage. Tapped primary \$6.50. Specials to order. Prices are mounted with leads. For Deluxe model with fuse and terminals add \$3.50. Name Plates for transmitter panels engraved to order, \$2.00.

One Day delivery
HILET ENGINEERING CO., Orange, N. J.

RADIO BARGAINS FULLY GUARANTEED

Tubes UX type, 30 day replacement guarantee, No. 210, \$2.25; No. 250, \$2.35; No. 281, \$1.85; No. 280, 95c; No. 245, \$1.25; No. 224, \$1.25; No. 227, 75c; No. 226, 65c; No. 171, 75c.

Low Power Transmitter, adaptable for phone or code. With plug-in Coils.....\$14.75

Short Wave Sets, one tube complete with 5 coils, 14 to 550 meters.....\$6.45

Auto Radio—Uses 3-224 and 3-227 tubes, single dial, tremendous volume. Compact. Fits any car.....\$20.00

Stromberg Carlson telephone transmitter on desk stand.....\$2.75

B Eliminator, Dry, 180 volts, will operate up to 10 tube set, with 280 tube, fully guaranteed.....\$6.75

250 or 245 Power Condenser Blocks, 12 Mfd., 1000 volt A. C. test, tapped 2,2,2,4,1 and 1 mfd.....\$4.75

2 Mfd. Condenser Packs, 2000 volt A. C. test \$7.90
1500 volt.....\$3.80

Double Chokes, 30 henry each, 160 mls., 1500 vt. test, shielded.....\$4.95

130 mls.....\$3.75

Power and Filament Transformers for 226, 227 and 171 tubes, with double choke.....\$4.00

No. 1093 Power Transformers, shielded, Sec. 600 V. for one 281, one 250, one 227, four 226 tubes and 2 chokes.....\$5.00

AC-A, B, C. Power Packs, completely assembled, \$8.75. 250 V. B. also has A. C. filament for up to 9-tube set. Can be used as B eliminator. Make your battery set all electric, or build your A. C. set around this pack. 280 tube for this pack, 95c extra.

Thordarson Transformers, 1 to 1.....\$1.00

CHAS. HOODWIN Co.

4240 Lincoln Ave., Dept. J-8, Chicago, Ill.

DEALERS IN BANKRUPT RADIO STOCKS

ACME WIRE PRODUCTS

Coils — Magnet Wire Wound

Magnet Wire All Insulations

Varnished Insulations

Parvolt Filter and By Pass Condensers

All products made to Recognized Commercial Standards including those of:

National Electric Mfrs. Assn.

Radio Manufacturers Assn.

American Society for Testing Materials

For more than 25 years manufacturers and suppliers to the largest and most discriminating users.

THE ACME WIRE CO.

NEW HAVEN, CONN.

Branch Offices:

New York 52 Vanderbilt Ave. Cleveland Guardian Bldg.

Chicago
842 N. Michigan Ave.

Remote Control!

WE control the newsstand distribution of *QST* separately, of course. The technical level and purpose of *QST* in the radio field makes it necessary to limit its newsstand output — though we do our best to make it easily obtainable. A dealer tells you he hasn't a copy of *QST*: as a layman, think a moment and try to estimate the number of newsstands in the United States and Canada. It would be financial suicide to try to furnish *QST* to each.

What are we driving at? Simply this — *QST* is the ideal type of magazine to which you should subscribe. You will find it neatly wrapped in your mail basket each month, and you will eliminate the "monthly tour" because its distribution is obviously limited and many dealers quickly sell their quota.

What we have just said has much to do with the regular monthly appearance of the blank on page 94 of *QST*. You'll be glad you used it!

West Gulf Division Convention Houston, Texas, October 10th and 11th

WATCH for the October issue of *QST* for full particulars.

Strays

W4AFL has a push-pull transmitter with only one tube, according to W4JO. The grid is pushing against the plate and the plate is trying to pull the power-house in!

One of the mail order houses is selling chokes designed especially for amateur use. The secret of their efficiency is in the winding, which is triple-covered *paraffin*. No details are given as to the material used to cover the paraffin, but we imagine any conductive material will do.

The filament rating on the Type 231 output tube, described in July *QST*, has been changed from 0.15 to 0.13 ampere, the terminal voltage remaining the same.

A simple code practice outfit can be made from the short-wave receiver by increasing regeneration until the detector howls, and then putting a key in series with the 'phones. Buzzer troubles and noise are eliminated. — W7MM.

SEND TODAY for valuable information on the new Non-Inductive Vitrohm Resistors in plaque form. Lower prices, more efficient operation in transmitters and Vitrohm quality are factors you can't overlook. Get the dope now.

WARD LEONARD ELECTRIC CO.

Mount Vernon, New York

*Have you received your call cards yet? The new design is attractive and easily read.
A supply is yours for the asking.*

EVERY LICENSED AMATEUR
NEEDS THE NEW

A. R. R. L.

LOG BOOK

SEE INSIDE BACK COVER
THIS ISSUE

P A C E N T

Duo Lateral COILS

Radio engineers and laboratories with real records of accomplishment use Pacent Duo Lateral Coils. They come in all standard turn ratios.



Write for information
and prices

PACENT ELECTRIC CO., INC.
41 Seventh Avenue New York City

CONTROL Counts Most!

BABE RUTH recently wrote that "Control makes a pitcher and lack of it breaks him." Simple . . . easily understood.

In radio it's also a case of CONTROL. That's where CENTRALAB comes to bat with a Volume Control that is as smooth as Dizzy Vance's pitching—yet as powerful as Babe Ruth's slugging.

CENTRALAB volume controls in millions of radio receivers are making this a nation of red hot radio fans.

Write Dept. 320-F for Free Booklet, "Volume Control, Vol-
lage Control and Their Uses"

Centralab

CENTRAL RADIO LABORATORIES
Dept. 320-F. Keefe Avenue & Humboldt
MILWAUKEE :: WISCONSIN

followed by Prof. J. A. Martin, who gave one of the finest practical demonstrations on ultra-short-wave work it has ever been the writer's pleasure to witness.

Following the contests, the gang assembled for the banquet where, after plenty of food, music and entertainment Dr. Woodruff assumed the position of toastmaster and introduced Messrs. Handy and Budlong, of Headquarters, and Assistant Radio Supervisor Grinnell. The latter's remarks, in particular, will probably be remembered for some time to come. Prizes, donated in quantity by friendly manufacturers, were distributed at the last; we are sure everybody must have had at least one, and such people as "Lindy" walked off with practically entire station lay-outs!

In closing, we must again extend hearty congratulations to Messrs. Brotherson and Wagner, and their associates of the Erie Club, for putting across a top-notch convention; we suggest that other clubs planning conventions might study this particular program with profit. The combination of a real outing with just the right amount of good technical sessions is an ideal one. After all, the purpose of a convention is to learn a little, but also to meet the other fellow and have a good time. The Erie convention was ideal in all three respects.

— A. L. B.

Book Reviews

Radio and Its Future, by Martin Codel. Published by Harper & Brothers, New York. 349 pages; illustrated. Price, \$4.00.

To exploit the layman's interest in the romantic side of radio communication, a number of books have been thrown together and presented. Many of these have had little if any merit. Only a few have been worth writing. The serious amateur who thumbs through some of these works of imaginative enthusiasm is affected with the weary cynicism typical of those who know too much about the limitations of radio.

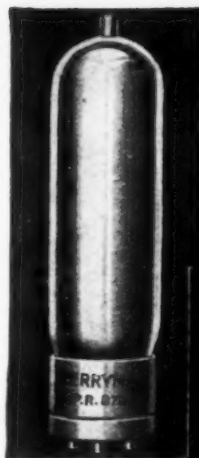
It refreshes one to pick up *Radio and Its Future*. This book represents the collaboration of the best minds affiliated with the several branches of radio with Martin Codel, Washington newspaper correspondent, whose signed articles on radio in the daily press are well-known throughout North America.

In eighteen pages of his delightful writing, Mr. Maxim presents a picture of the radio amateur, who "has never yet been given a problem he could not solve." To the amateur, this presentation exemplifies the spirit of accuracy and impartiality with which the entire book is impressed. A. Y. Tuel, Vice-President and General Manager, Mackay Radio and Telegraph Company, tells the absorbing story of maritime radio. The development and possibilities of international broadcasting are presented by C. W. Horn, General Engineer of National Broadcasting Company. M. H. Aylesworth, President of that Company, outlines the special functions of broadcasting which are making for its permanency and influence the social scheme. Most of the great names in contemporary radio are represented; the field is covered, from television to aircraft radio, from advertising to law. Technically, sociologically, economically, the whole view is authoritatively presented. *Radio and Its Future* is an excellent book.

— Paul M. Segal.

Say You Saw It in QST — It Identifies You and Helps QST

FOR PURE D.C. POWER SUPPLY



P. R. 872

Fil. Volts - - 5
Fil. Amps. - - 10
Peak Inverse
Volts - - 5,000
Peak Plate
Amps. - - 2.5
Voltage Drop - 15
Overall
Length - 8 1/2"
Overall
Diam. 2-5/16"
Price - - \$18.00



P. R. 866

Fil. Volts - 2.5
Fil. Amps. - 5
Peak Inverse
Volts - 5,000
Peak Plate
Amps. - 0.6
Voltage
Drop - - 15
Overall
Length 6 1/2"
Overall
Diam. 2 3/8"
Price - - \$8.00

UNDER the new regulations all amateurs must use an adequately filtered D. C. current supply.

P. R. 866 and P. R. 872, both mercury vapor rectifiers, besides emitting a wave form easy to filter, furnish a stable source of plate voltage—full load or no load, because both tubes possess a low and practically constant voltage drop. The unusually long life of the P. R. 866 and P. R. 872 is due to the low operating temperature of the oxide coated filament combined with the extremely low voltage drop resulting from their mercury content.

Use these Perryman rectifiers, famous for their rugged strength, in bringing your station in line with the new regulations.

Attractive prices for licensed amateurs

PERRYMAN ELECTRIC CO., Inc.,
4901 Hudson Blvd., North Bergen, N. J.

Enclosed please find money order for \$.....for
check
..... P. R. 872 at \$18.00. P. R. 866 at \$8.00.

Name.....Station.....

Street.....

City.....State.....

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.

(3) The Ham-Ad rate is 15c per word, except as noted in paragraph (6) below.

(4) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.

(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.

(6) A special rate of 7c per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, if by a member of the American Radio Relay League takes the 7c rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and takes the 15c rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column regardless of which rate may apply.

PLATE power for your set, the very heart of its performance. For quietness, DX ability, life-long permanence, absolute dependability, lowest ultimate cost, no other plate source even approaches the achievement of an Edison steel alkaline storage B battery. Built painstakingly; every joint pure nickel, upset electrically welded. Genuine Edison Electrolyte. Our list describes complete batteries, construction parts, enameled aerial wire, silicon steel. Available immediately, filament and plate transformers for the new 872 rectifier, complete plate power units. Rectifier Engineering Service, radio W8ML, 4837 Rockwood Road, Cleveland, Ohio.

THE finest in radio for amateur, broadcast and marine. The most modern short-wave receivers. Four to ten tube designs. Radiophone CW transmitters of any power or type. We make a complete line of apparatus, including speech amplifiers, filter coils, inductances, power units, etc. Any special apparatus, designs, built to order, using your parts if desired. Prices on request. New bulletin lists complete line of apparatus. Write for copy. Ensell Radio Laboratory, 1527 Grandview St., S. E., Warren, Ohio.

AMATEURS — experimenters, builders. We serve over 4000 I.R.E., A.R.R.L., etc., experimenters and "nuts." Full discounts. \$50,000 stock approved parts — no sets. Over four pounds catalog, circuits, data, prepaid, 50c. Weekly bulletins (new items, results of experiments, etc.), 20 weeks \$1. Sample experimenters "Over the Soldering Iron" magazine, 25c. Transmitting data, price list, etc., 25c. Kladgar Radio Laboratories, established 1920, Kent, Ohio.

SPECIAL rectifier aluminum, \$1.25. Lead, \$1 square foot. Elements 1 x 4 15 cents, 1 x 6 17 cents pair. All prepaid. Best silicon transformer steel cut to order, 25-35 cents pound. Postage extra. George Schulz, Calumet, Mich.

TELEGRAPHY — Learn Morse and wireless telegraphy. Big salaries. Tremendous demand. Expenses low, can earn part. Catalog free. Dodge's Institute, Wood St., Valparaiso, Ind.

SILVER—Marshall 737 Bearcat short wave receiver, wired, \$83.50. All S-M parts in stock. 40% and 2% to hams. Write for best prices on 737 kit and for our special price list on standard parts. Radio Inspection Service Co., 193 Trumbull St., Hartford, Conn.

G.E. 1000-watt transformers, 1100-2200-4400 each side center tap. Used by Cornell, Navy, and 300 hams. Guaranteed unconditionally, \$12. F.O.B. Some 500 watters, no center tap (bridge circuit), \$5.00. Detroit, Fred G. Dawson, 3740 Woodrow, Detroit, Mich.

LOCATING buried treasure by radio offers hams profitable diversion. Accurate. Fascinating. Details for red stamp. Exchange, Box 607, El Monte, Calif.

QSLs \$1 per hundred. W9BEU, 9032 Windom Ave., St. Louis, Mo.

CRYSTALS for sale or trade. W9CVT, Dr. S. J. Blum, 702 Shukert Bldg., Kansas City, Mo.

WILL trade receiver and loudspeaker for good typewriter. Orville Alexander, Cairo, Mo.

SELL REL 209 c.w. and phone transmitter. Any reasonable offer accepted. WSDCY, Nicktown, Pa.

TRADE or sell set of drums. Value, \$185. What have you in the transmitting line? Long wave receiver? etc. H. P. Brewer, Y. M. C. A., Ottumwa, Iowa.

SELL — Three used W.E. 211Ds at \$12 each. Two used W.E. 211As at \$10 each. Money back if not satisfied. H. J. Moran, 1776 Castlehill Ave., Bronx, N. Y.

VIBROPLEXES — new and parts. Rebuilds, \$10. Lydeard, 28 Circuit, Roxbury, Mass.

JEWELL meters No. 54, 0-1000 v. with external resistor, 1000 ohms per volt, \$13. Same 0-2000 volts, \$14. Edison 6-volt battery, \$12. Edison 6-volt battery box with 5-ampere Tungar charger, \$8. General Radio 247W wavemeter with 3 coils, \$10. Write for lists. M. Leitch, 34 S. Park Drive, West Orange, N. J.

\$35 takes Silver Marshall Round the World Four Receiver with coils, new tubes and three Layerbilt batteries. Chas. Piccone, Mancos, Colo.

SELL — New G.E. 24/750-volt dynamotor, \$22.50. New S-M Round the World Four, \$20. Trade 12-inch, 220-volt fan for parts. Henry W. Ray, Indianola, Miss.

CRYSTALS with a guarantee of complete satisfaction. 700 ke., \$15; 3500 ke., \$12; blanks, \$4. W9DRD, Herbert Hollister, Edwardsville, Kans.

SELL — 1930 Hartley transmitter and receiver, \$30. Write Don McKinley, 215 4th Ave., E., Oskaloosa, Iowa.

CLOSING OUT — Sell everything, including S-M. 600 amplifier, Jewell Pat. 74 R. F. Meter 0-0.5, Four Jewell Pat. 54 0-1 mill. milliammeters, three double button microphones. Floor and deck stand. Four Racon trumpets, and other articles. List upon request. Glade Brett, Spirit Lake, Iowa.

QSLs, two colors, 90c per hundred. W9DGH, 1816 Fifth Ave. N., Minneapolis, Minn.

CODE: Learn the code with our improved learner's device, which has a beautiful, steady tone like a commercial station. Equipped with good telegraph key and headset. Ready for use \$17.50 postpaid. Summit Electric Co., 561 Brussels St., San Francisco, Calif.

THROUGH hamming! Buy my equipment cheap. Send for Bargain-List. Curtis, 1109 Eighth Ave., Fort Worth, Texas.

TRADE transmitting apparatus, receiver. Want typewriter, teleplex, parts. W2BG.

BEST offer takes one marble base key: 1925, 1926, 1927, 1928, 1929 issues QST with three binders and Handbook, 15 Raytheon BHs, \$2 each; 6 Bs, \$1 each; 4 BAs, \$3 each; 2 876's, \$2 each; 4 281s \$3 each; one I.R.E. binder, \$1. J. G. O'Shea, Darlington, Pa.

1930 transmitter 10 watts, complete with tubes. Full wave rectifier. Best offer takes it. Branko Marohnic, Route No. 1, Gladstone, Mich.

SALE — Pilot super wasp d.c., good condition, \$25. F. E. Latham, W8CYQ, Penn Yan, N. Y.

SHORTKUT to Code Reading Speed. These results produced in few hours. With Radio Shortkut 25; High Speed 35; Morse Shortkut 20. Users surprised. Reports all districts on request. Methods, \$5 each, money order. C.O.D. if deposit \$2. Dodge Radio Shortkut, Box 100, Mamaroneck, N. Y.

LEARN code at home with our famous code machine. Only \$9.85 c.o.d. Formerly sold for \$25. Codegraph Co., Box 161, Winchendon, Mass.

TUBES — 210, \$1.85, 2 for \$3.50; 281 \$1.50. 5-day replacement. Postage extra. W9BOR, 4544 Pierce St., Gary, Ind.

W8CUX for QSLs. Nuff sed.

TWO photo-cells. Eveready Raytheon, slightly used, one hour each — guaranteed — \$14.50 each. C. Weant, 4213 Springwood Ave., Baltimore, Md.

SELL — dynamotor — G.E. 24/1500 v. with extension shaft. Best offer. W. Hamburg, 3996 Lovell Ave., Cheviot, Ohio.

QSLs 100 two-color, \$1. Stationery. Samples. W9CKA, Corwith, Iowa.

RECTOBULBS, Type R3, new and guaranteed, \$9. Selling extra equipment. W9AXH, 4130 N. Meridian St., Indianapolis, Ind.

TRANSFORMERS — made to your order. Amateurs, Custom Builders, Servicemen: We build power transformers and chokes to your specifications. For power amplifiers, radio receivers, transmitters, etc. Quality products, quick service, moderate prices. Write for quotations, stating voltages, current, approximate physical dimensions, and number desired (if more than one). Baker Engineering Labs., 2131 Curdes Ave., Ft. Wayne, Ind.

DURALUMINUM. Specially treated for microphone diaphragms, .002" x 4" x 4", \$2. Gold spot for carbons, \$3. W9BWI, Ft. Wayne.

TRADE new 16MM. moving picture camera for large transmitting tubes. Sell screen-grid receiver and CW transmitter cheap. Send for list. W2CIT, Seaford, N. Y.

QSL cards, logs, message blanks, etc. Seldens', Cranesville, Pa.

POWER CRYSTALS: Guaranteed excellent oscillators. One inch square sections of your approximate specified frequency. Special prices: 7000 ke. band, \$11.50; 3500 ke., \$7.50; frequency precision, .1%. Precision Piezo Supply, 427 Asia St., Baton Rouge, La.

TRANSFORMERS? Here is what you have been looking for and at the lowest prices ever. Dongan 250-watt transformers with Areturus line ballast tubes. Primary: 110-120 v. a.c. Secondary: 1500 v. center-tapped at 750 v. Filaments: 7½, 7½ et. 2½ et. 15 v. There is a limited quantity, so rush your order. Priced to sell fast at \$6.50. 150-watt transformer with outputs of 600 v. 7½ et. 7½ et. 2½, 1½. Reduced to \$2.75. Cash or C.O.D. Columbia Specialty Co., 1038 Longwood Ave., New York City.